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BRIEF

DESCRIPTION OF THE

AMERICAN SYSTEM OF WATER PURIFICATION

OR

RAPID FILTRATION

AND

SEWAGE DISPOSAL,

PROTECTED BY GLOVER SECOND PATENT AS CONSTRUED BY

UNITED STATES CIRCUIT COURT OF APPEALS FOR
THE FIRST CIRCUIT.

By

AMERICAN WATER PURIFICATION COMPANY AND AMERICAN
SEWAGE DISPOSAL COMPANY OF BOSTON,

JOHN N. McCLINTOCK, A.M., C.E.,

PRESIDENT AND GENERAL MANAGER,

Office, 643 Old South Building.

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No.

539,522.

To all to whom these presents shall come:

Whereas Amasa S. Glover,
Drockton, ♂ Massachusetts,

has presented to the Commissioner of Patents a petition praying for the grant of Letters Patent for an alleged new and useful improvement in

Sewage Apparatus

a description of which invention is contained in the Specification, of which a copy is hereunto annexed and made a part hereof, and has complied with the various requirements of Law in such cases made and provided, and

Whereas upon due examination made the said Claimant is adjudged to be justly entitled to a Patent under the Law:

Now therefore these **Letters Patent** are to grant unto the said

Amasa S. Glover, his heirs, or assigns
for the term of Seventeen years from the fifth- day of
May, one thousand eight hundred and ninety six,
the exclusive right to make, use and vend the said invention throughout the
United States and the Territories thereof.

In testimony whereof I have hereunto set my
hand and caused the seal of the Patent Office
to be affixed at the City of Washington
this fifth- day of May,
in the year of our Lord one thousand eight hundred
and ninety six, and of
the Independence of the United States
of America the one hundred and twentieth

Courtesy
Dasher. First Assistant Secretary of the Interior
Acting Commissioner of Patents.



BRIEF
DESCRIPTION OF
AMERICAN SYSTEM OF WATER PURIFICATION OR
RAPID FILTRATION
AND
SEWAGE DISPOSAL,
PROTECTED BY PATENT AS CONSTRUED BY COURT OF LAST RESORT,
THE UNITED STATES CIRCUIT COURT OF APPEALS
FOR THE FIRST CIRCUIT.

To whom it may concern:

We wish to call your attention to our system of rapid filtration, which applies to the purification of water more or less contaminated, intended for domestic use, or of sewage.

We come to you with a system protected by a patent construed by the court of last resort in patent causes.

The condensed opinion of the United States Court of Appeals for the First Circuit is as follows:—

Upon full consideration of the whole case, we find that the first Glover patent does not disclose the septic tank, and that the second Glover patent is for a system of rapid filtration, comprising two series of filter beds, one inside a ventilated structure and the other outside. It follows that the defendant's apparatus does not infringe the Glover patent in suit by using a septic tank or septic tanks in combination with filtering beds.

The Supreme Court of the United States have denied a petition for a writ of certiorari; and the Circuit Court of Appeals for the First Circuit have reaffirmed their finding, as quoted above; and this finding may be regarded as final and as the established law of the land.

9-26532

For those skilled in the art of filtration, and the public, to clearly understand the meaning of the above construing of the patents, and to understand how the court have construed the basic patent broadly to cover and protect a discovery and invention of vital importance, it is necessary to understand the exact meaning of the term "septic tank," as used by the court; the meaning of the term "rapid filtration," and how the defendant's apparatus, that does not infringe, is constructed and used.

Glover disclosed his discoveries and inventions by patents that require careful reading and study, and some knowledge of the art of filtration, before the same become clear and lucid statements as to how the specified apparatus should be constructed and used to obtain rapid filtration. The opinion of the court also requires to be read and studied with care and some knowledge of the art to be clearly understood.

HISTORY.

While Glover's great discovery and invention were becoming known and used literally around the whole world,—spreading throughout Great Britain, the continent of Europe, India, the Philippines, Japan and the Dominion of Canada,—Glover was like the prophet who was not without honor save in his own country. We do not refer to social, civic or military honor, but to Glover's prophetic honor in the line of rapid filtration. It was a difficult matter to find works in our home circuit that illustrated Glover's ideas. We found a concern using the Glover apparatus after a fashion, laid our patent before the partner having the patent business of the company in charge, and called for a settlement. Partner seemed to think the patent disclosed the invention, paid us a small amount of money, did not carry out the rest of agreement, which was to aid to establish the validity and scope of patent, and shortly afterwards we were publicly charged with *blackmailing* a concern that is said to have accumulated an enormous fortune by similar underhanded means of collecting a royalty for the use of a patented apparatus.

We learned that before we could collect a royalty without blackmailing, unless we represented an aggregation of capital that can ignore the law, we were bound to have the court construe our patent and adjudicate as to its validity and scope. We found a beautiful illustration of our system of rapid filtration in the Second Circuit, and parties willing to fight; but when it came to trial,

parties lay down, would not fight, paid our royalty. Our case in Third Circuit was met with the Fabian policy of procrastination and delay that bade fair to carry the case into the next century.

We brought suit against defendant, not because defendant's apparatus is modern or fairly illustrative of Glover's ideas, but because it gave us a chance to test the validity and scope of patent by having the court construe it, because defendant wanted a little legal excitement, and because it was, in a way, Hobson's choice.

We are satisfied that the court have given a broad and comprehensive scope to patent in construing it; defendant is satisfied because defendant's apparatus is found not to infringe.

WHAT WAS KNOWN ABOUT FILTRATION IN 1893, OR THE STATE OF THE ART.

At that time it was found possible to filter 25,000 gallons of sewage daily upon an acre of open-air sewage sand filters, constructed of the proper filtering material, properly underdrained and ventilated, by the bacteriological process known as oxidation or nitrification. At this rate an inch of sewage was applied to the filter daily; 2 inches was the limit; more than the usual amount would quickly render the filter inoperative; it would either clog the filter or escape unpurified.

To understand why an oxidizing filter clogs at an excessive rate it becomes necessary to explain the nature of sewage. Sewage carries from 1 to 3 per cent. of suspended matter, largely carbonaceous and nitrogenous, the former of vegetable and the latter of animal origin, the whole known as organic matter. The carbonaceous matter, largely responsible for clogging the surface of a filter, is composed chiefly of wood fiber.

When 50,000 gallons of sewage are applied to the filter, it covers it to the depth of 2 inches, and leaves a mat of organic matter thereon from $\frac{2}{100}$ to $\frac{6}{100}$ of an inch in thickness. This mat loses some of its thickness by evaporation before the filter receives the next dose of sewage; but it can be seen that unless the mat is scraped off from time to time it will clog the filter. It is of common knowledge that the finely divided organic matter also penetrates below the surface of filter, and, if not oxidized and literally consumed, will clog the filter and prevent its filtering.

RAPID FILTRATION.

The Circuit Court found as follows:—

Oxidizing bacterial action on open-air sewage sand filters was well known, and is not claimed as new with Glover. The secondary filter beds, located outside the structure, are intended for this well-known process.

The following is taken from the report of the Massachusetts State Board of Health for 1895, p. 61:—

The purification of sewage by intermittent filtration is not merely mechanical; that is, it is not a straining through fine pores, thereby holding back the organic matters in the sewage, but it is a chemical change in which the substances are converted into mineral matter, which passes off daily in the purified effluent. To effect this change . . . the necessary conditions are very slow motion of very thin films of liquid over the surface of particles having spaces between them sufficient to allow air to be in contact with the films of liquid. . . . [In] experiments with two filters containing the same kind of sand at Lawrence, to one of which sewage was applied upon the exposed surface of the sand, and to the other [ventilated] beneath a layer of loam [referring to the Glover Andover plan], it was found that the amount of sewage that could be disposed of by the former was more than twice as great as by the latter.

It is of common knowledge that the capacity of an oxidizing sand filter, purifying liquid by what is commonly known as slow sand filtration, depends upon the character of the liquid treated. In 1893 and to-day, by slow sand filtration or intermittent filtration, an acre purifies or filters 25,000 gallons of sewage in a day; but the same filter bed, by the same process of slow filtration, purifies, it may be, 2,000,000 gallons of contaminated river water.

Thus when the court find that our patent is for a system of rapid filtration, comprising two series of filter beds, one in a ventilated structure and the other outside, and the State Board of Health of Massachusetts inform the public that the efficiency of an oxidizing filter in a ventilated structure under a bed of loam is reduced by more than half, the combination of the two to effect rapid filtration demands and implies other action in the inclosed filter than oxidation; otherwise, the filtration instead of being rapid would be slower than slow sand filtration, even with primary and secondary filter

beds of the same size, and both acting to their full capacity; whereas the patent specifies that the secondary beds shall be of much larger area than the primary beds.

To make this Point Clear.

An acre will oxidize and filter 25,000 gallons of sewage in a day. A $\frac{1}{4}$ acre will oxidize and filter 6,250 gallons of sewage in a day. The two working to full capacity will filter 31,250 gallons in a day, both in the open air. A $\frac{1}{4}$ acre in structure will oxidize and filter 3,125 gallons in a day. A $\frac{1}{4}$ acre in structure and 1 acre outside, both working to full capacity, will oxidize and filter 28,125 gallons in a day. The two working in combination, as specified by patent, will oxidize and purify and filter 3,125 gallons in one day. If action is reversed, sewage passing from secondary bed to primary bed, the two combined will filter 25,000 gallons in a day; thus using $1\frac{1}{4}$ acres to do the work of 1 acre; whereas working as specified it will operate one-eighth as fast as secondary bed without the primary bed.

Two hundred and fifty thousand gallons per acre per day may be called rapid filtration. With such rate on secondary bed of 1 acre, rate on primary bed of $\frac{1}{4}$ acre would be 1,000,000 gallons per acre per day.

Build a $\frac{1}{4}$ acre tank, water tight, 7 feet deep; fill with ordinary filtering sand, 3 feet deep, that will pass 75,000,000 gallons of clear water in a day to an open-air sewage sand filter of 1 acre, and the two in combination as oxidizing filters will purify or filter 3,125 gallons of sewage in one day; while the secondary filter, without the primary, will filter 25,000 gallons in the same time.

If instead of using it as an oxidizing filter you charge it with 250,000 gallons of sewage, filling the spaces in the sand with the sewage, the sewage will stand to a depth of 28 inches over the sand, 12 inches of sewage being received and held in the interstices of the 3-foot filter. If a like amount is applied to filter the second day, the rate of filtration is said to be 1,000,000 gallons per acre per day.

Assume that it takes twenty-four hours for filter to become charged, the sewage the second day will begin to run out, as fast as it runs in, from the outlet pipe built as specified upon the secondary bed of 1 acre by way of distributing channels, and the effluent from the underdrains will be perfectly purified.

At the end of the month 1 inch of the sand in primary bed is removed on account of loss of head caused by clogging; the apparatus operates just the same in purifying 250,000 gallons of sewage daily. At the end of the second month another inch is removed, and the filter bed works just the same.

Remove an inch of sand every month for three years, and the bed works just the same, month after month.

It is not difficult to explain to the unskilled public why Glover's primary filter bed, filtering at such a rapid rate as 1,000,000 gallons per acre per day, does not clog, when if used for oxidation it would quickly clog at a tenth of said rate. If the sewage flows at a uniform rate, in seven hours the filtering material will be saturated, and the suspended matter will be largely arrested by surface of filter; thereafterwards, when bed is charged with sewage, there ensues a mechanical separation of the matter in suspension, which may be thus broadly explained. The liquid, brought to a state of almost perfect rest, having a very slow movement, has a natural tendency to clarify itself by the difference in specific gravity between the liquid and the matter in suspension, the light, fatty, carbonaceous matter floating, the heavy nitrogenous matter sinking. Thus the matter that clogs the ordinary filter is kept 28 inches above the surface of filter when the filter is doing its duty, and is sustained in place by the liquid.

The nitrogenous matter, the waste product of animal life, from which life has departed, comes to the bed in a state of decay or putrefaction, and the decay and disintegration continue, greatly accelerated by the conditions afforded by the tank and the presence of other rotting matter. It does not require scientific knowledge, and very little observation, to know that a piece of meat, which is nitrogenous, will rot quicker than a piece of wood, which is carbonaceous; and that wood in a damp place, as on the damp loam, will rot quicker than on a dry masonry foundation.; that finely divided organic matter will rot quicker than large bodies; that such substances as butter and milk, if exposed to putrefaction, will putrefy; and that Glover's primary filter bed, separating, arresting and retaining all imaginable rotting things, becomes a very hotbed of rot.

Thus the finely divided nitrogenous matter arrested by surface of filter quickly rots, the water which forms its chief constituent being released and flowing through filter, while the gases entering

into its composition bubble up and float away from the surface of the liquid, if provision is made for their escape.

The rot also attacks the fatty and carbonaceous matter on the surface of the liquid, and treats it in the same manner, only more slowly.

The rot or fermentation, commencing with the nitrogenous matter on surface of filter and acting on the floating matter, extends down through the whole body of the filtering material, converting it into a rapid anaerobic filter bed, so that, as Glover expressed it, "the effluent is clarified and partially purified" without offense, and is ready to receive subsequent rapid treatment upon small open-air sewage sand filters.

Glover's idea, undoubtedly, was to adapt the filtering material to the character of the liquid to be treated, sand or gravel being required for one liquid, and only suitable construction for another.

To find out the limit of this rapid filter; after the sand is all removed, let 500,000 gallons be treated in one day. Still it works well in purifying the sewage.

It treats 1,000,000 gallons of sewage in one day, and has been found to work at that rate for seven years satisfactorily without clogging secondary filter.

This apparatus, operated as Glover specifies it should be operated, by primary filtration and secondary filtration, will emit a non-putrescible effluent, harmless, odorless and colorless, of 5,000,-000 gallons a day; whereas by oxidation it will purify 3,125 gallons, and quickly clog if more than that amount is applied.

That is, the same filter will work sixteen hundred times more rapidly if it is worked right than if it is worked wrong; and ten times more rapidly if the filtering material is used in the ordinary way for slow sand filtration, than if it is worked as two oxidizing filters in combination.

Now, when the court state that the system is for rapid filtration, and a given amount of filtering material will filter ordinarily by slow sand filtration 31,250 gallons, and by the way specified by patent and disclosed to the experts 5,000,000 gallons, and by oxidation 3,125 gallons, the court cannot reasonably intend to confine action in beds to oxidation.

If the above-suggested apparatus be used to filter contaminated river water, it may be found possible to purify daily 2,000,000 gallons by slow sand filtration, or oxidation in secondary bed, — a

higher rate clogging filter or not purifying effluent. The primary bed, at same rate, will purify 500,000 gallons daily. Acting together in combination for oxidation the two will purify 500,000 or 2,000,000 gallons, according to which way the current runs.

Operated as Glover's primary bed should be operated, in combination with the secondary bed, the apparatus will readily purify 10,000,000 gallons daily, whether the action in the primary bed to cause rapid filtration is that of anaerobic or facultative bacteria.

Porous Pipes.

If one skilled in the art of filtration were designing and constructing one of our primary filter beds of one-fourth of an acre, "composed of filtering material, such as sand and gravel, or any of the materials used for such purpose, resting on a liquid-tight concrete bottom," he finds that the patent specifies that "An outlet pipe communicates with the filter bed and receives the effluent therefrom, and delivers it to the corresponding secondary bed," in above case, of one acre.

In order that the outlet pipe may communicate with the filter bed there must be underdrains, or "a series of porous pipes, disposed upon the said bottoms and converging to an outlet pipe;" and, after the sand and gravel are all removed, as above suggested, "the walls of said pipes constitute the filtering material. The pipes have no direct communication with the spaces inclosed by the walls of the primary beds, and the effluent enters said pipes only through the porous wall of the pipes, which may be of unglazed earthenware."

It is in evidence that Glover preferred coarse gravel to sand for his filtering material in his primary bed; and of course the underdrains should be porous enough to permit the liquid matter to escape; and when they do become clogged they may be removed, like the other filtering material, leaving only the submerged inlet and outlet pipes.

Glover left out the submerged inlet pipe in one form of primary bed, and did not rely upon even the submerged outlet pipe; for he specifies that "The primary beds may be of any suitable construction to accomplish this end," *i.e.*, "to arrest the solid matter and permit the escape of the liquid matter." Glover's 1888 wall of gravel may accomplish this end; or a flashboard may be the filtering material that makes the primary bed operative for rapid filtration.

The patent specifies the apparatus; the court find it is for rapid filtration; and it is a self-evident fact to an expert that it must act as a rapid filter, as the court find, because it cannot possibly act in any other way.

Slow Filtration Impossible by Glover Apparatus.

We have attempted to demonstrate that rapid filtration by oxidation is a physical impossibility by the Glover apparatus; the Massachusetts State Board of Health, by experiments carried on at Lawrence, have demonstrated that slow filtration of any kind is a physical impossibility with the trapped outlet to the primary filter bed specified by the second Glover patent.

The following extract is from the report of the Massachusetts State Board of Health, 1890, pp. 125-129:—

The General Results with Tank No. 12.

Intermittent filtration of sewage continued with this tank of coarse sand from February 16 to July 26, 1888. In the last month the effluent was a clear, bright and colorless water, containing less free and albuminoid ammonia than ordinary public drinking water supplies. The same amount of sewage—the equivalent of 30,000 gallons per acre—was applied daily throughout the whole time of experiment. The organic matter of the sewage was being nearly all burned up, 99.2 per cent. of the nitrogenous organic matter being removed. On July 27 the outlet of Tank No. 12 was closed and the tank filled with sewage; after which, for four months, the surface of the sand was kept covered with sewage, and the same quantity as previously applied was daily drawn through the tank. The conditions of the filter were thus changed from intermittent filtration to continuous filtration, in which the surface was continually covered with sewage, so that no air could enter, and the liquid, as it passed down through the sand, filled all the space between the particles.

Continuous filtration resulted in a complete cessation of the burning up of the nitrogenous organic matter of the sewage. Some of this was stored in the filter, thus reducing the albuminoid ammonia of the effluent, but the sum of ammonias grew to be as great as those in the sewage on the surface. The effluent became somewhat turbid and had a strong odor.

Tank No. 12 was 60 inches in depth, and the sewage during this experiment was fifty days in going through the filter; thus demonstrating the fact that the Glover apparatus, which cannot oxidize rapidly, cannot filter continuously slowly. This information is for the public and not for experts,—because all experts know it, or they are not experts in the art of filtration.

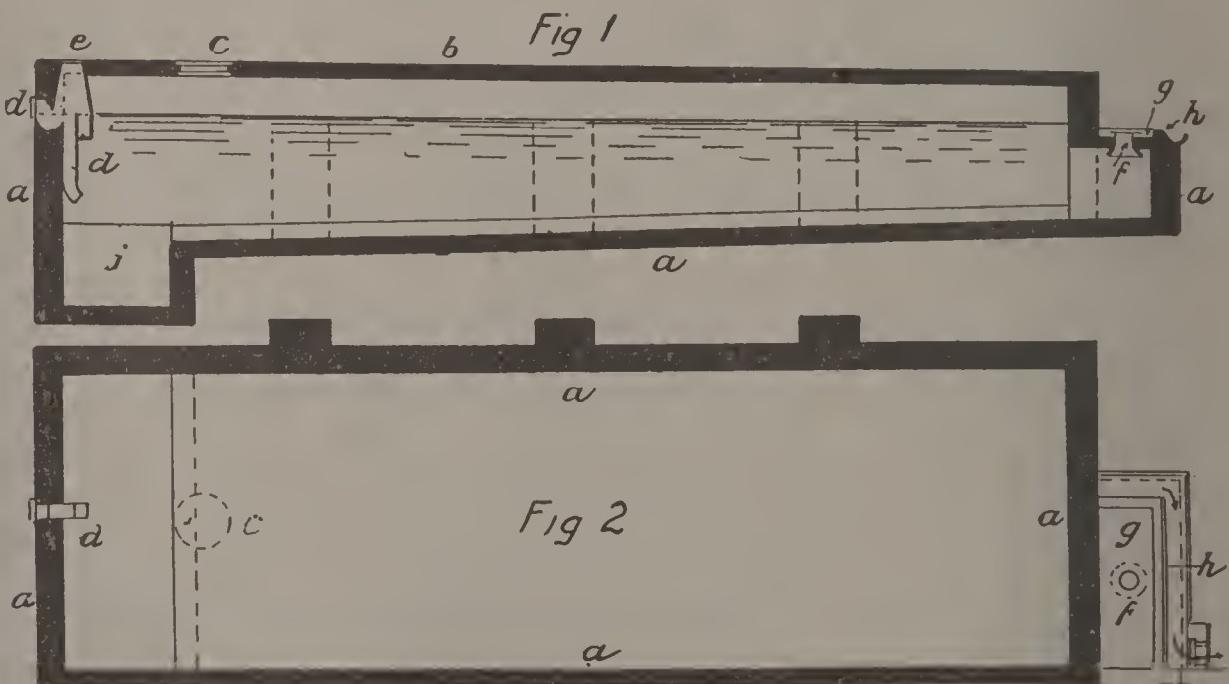
There can be no oxidation without ventilation. As a strainer it is not a filter. Sand fine enough for a strainer would clog at or beneath the surface near the inlet pipe with material like axle-grease, the clogging spreading over whole surface of filter and preventing escape of liquid matter; and not conforming to specification, which permits its escape.

It may not be modest for us to make the statement, but nevertheless it is true, that Glover invented the first, only and last apparatus for rapid filtration, whereby, without the use of chemicals, natural laws are relied upon to accomplish the end and permit and effect rapid filtration or purification.

THE SEPTIC TANK.

The Cameron tank is described under four claims:—

1. For the bacteriological treatment of sewage, a tank having an outlet (submerged).
2. For the bacteriological treatment of sewage, a tank having an inlet (submerged).
3. For the bacteriological treatment of sewage, a tank having an air-tight cover, an inlet (submerged), and an outlet (submerged).



CAMERON'S SEPTIC TANK.

Construction and use disclose septic action.

4. For improved apparatus hereinbefore described, and shown in the accompanying drawings, for the bacteriological treatment of sewage.

The patent specifies: "By this invention, further it is possible to get rid of the sludge difficulty because the solid portion of crude sewage is entirely thrown into solution; . . . the expense of dealing with the precipitated matter is also obviated."

The court find, and it is the law, that "the Cameron patent clearly describes the septic tank."

Therefore a septic tank is a tank for the bacteriological treatment of sewage, having an outlet submerged, an inlet submerged, and an air-tight cover.

Lest there should be any doubt on this matter of law, the court find:—

A still earlier description of the septic tank and septic process is found in the Mouras French patent of September 22, 1881, and the Mouras American patent, No. 268122, bearing date November 28, 1882.

The Mouras Automatic and Odorless Scavenger is thus described in said French patent:—

This apparatus of extreme simplicity is composed firstly of three agents, viz.:—

1. An air-tight tank, hermetically closed, of a capacity in proportion to the needs it is to satisfy.
2. A feed pipe, B, sealed to the top of the tank, and destined to receive evacuations, slops and rain water.
3. An elbow pipe, C, likewise fastened to the upper part of the tank, and serving to discharge the sewage contained in the tank.

The feed pipe B as well as the discharge pipe C, both well sealed, are to plunge from 10 to 15 centimeters into the liquid in the tank. This is what closes it hermetically.

Glover very wisely did not use the term "septic tank" as a name for that part of his apparatus for rapid filtration, wherein the "solids were converted into liquids, and both solids and liquids into gases," and which has provision for the removal of gases, which the septic tank has not; he did not have in mind, when choosing a name, the rotting action going on in his beds, but thought only, apparently, of the filtration and the purification therein of the polluted water.

THE SEPTIC PROCESS.

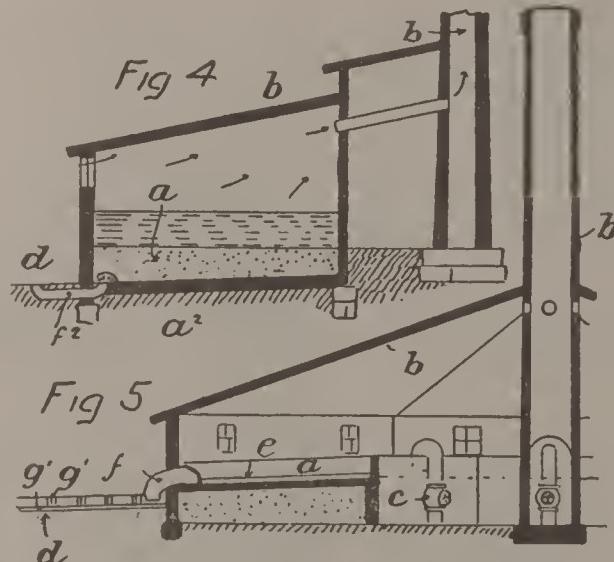
The court find that "the Cameron patent clearly describes the . . . septic process." The court have defined the term "septic tank."

As to the septic process the court are equally explicit; for the court state:—

Respecting septic action, it was said before the English Society of Arts, in 1886: "During spontaneous subsidence, which is a much slower process than precipitation, fermentation sets in. Solids are converted into liquids, and both solids and liquids into gases."

On the same subject, M. Moigno wrote, in January, 1882: "The mysterious agents of fermentation, causing the decomposition and liquefaction of the faeces, are the vibrios or anaerobic bacteria which, according to Pasteur, are destroyed by oxygen, and which manifest their destructive activity only in vessels from which the air is excluded."

In finding that the Cameron patent clearly describes or discloses the septic process in the Mouras or Cameron air-tight tank, with submerged inlet and outlet pipes, when the Cameron patent is silent as to whether the bacteriological action specified as in the



GLOVER'S PRIMARY FILTER BEDS,

The construction and use of which disclose that solids are converted into liquids, and both solids and liquids into gases, having provision for escape of gases.

tank differs from the well-known bacterial action in the open-air sewage sand filters, and makes no mention of the septic process, the court establish the law that the construction and use of the apparatus disclose the process.

The Glover second patent in the drawings forming a part of the specification shows, in one form of that part of the apparatus called the primary filter beds, submerged inlet pipes whereby the liquid-tight tanks are to be charged with sewage, and in both forms of the apparatus shows submerged outlet pipes; therefore, as the court find that the air-tight cover is not essential for the septic process even in the septic tank, the construction and use of the Glover apparatus must legally disclose the septic process or putrefactive action, if the Cameron apparatus, built in like manner, discloses it, as the court find that it does.

There is no doubt of the fact that the Cameron tank, by its construction and use, discloses the septic process, as found by the court, as the septic process is defined by the court, but not as defined by the Cameron patent, whereby in the tank, by bacteriological treatment, "the solid portion of crude sewage is entirely thrown into solution," and whereby "the expense of dealing with the precipitated matter is also obviated."

The tank by which even the organic solid matter of crude sewage is entirely thrown into solution is a dream yet to be realized.

Mr. Glover did claim an absolute disappearance of all solids, *either* in the central tank of the system, *or* the subsequent filters grouped around the tank.¹

Putrefaction as a process must have been recognized by our remote ancestors before they moved into their caves; some animals, like the hyena, recognize it; some birds, like the vulture, recognize it; some fish, like the salmon, recognize it, because the salmon avoids it; putrefaction was well known, and is not claimed as new with Glover.

Pasteur is universally credited with the discovery that putrefaction is a living ferment due to the absence of air. If Pasteur invented the so-called Pasteur filter, he certainly did not discover rapid filtration. It is not claimed that Glover discovered that putrefaction is a living ferment.

GLOVER'S DISCOVERY.

What Glover did discover and disclose to the world in his first patent was not the air-tight septic tank, but the fundamental principle that putrefactive action is due not to the absence of air

¹ Transactions, American Society of Civil Engineers, Vol. XLVI. (1901), p. 474.

but to the presence of water or moisture. He applied his great discovery to the disposal of the solid and offensive matter in municipal sewage.

Glover's next notable discovery is on record in the 1888 report of the Massachusetts State Board of Health, p. 11:—

Mr. Glover's original scheme, as far as it relates to the purification of sewage, consists of three principal parts:—

1. A settling basin, which, without the aid of chemicals, is intended to separate and retain the solid portion of the sewage.

2. A wall of gravel at one end of the settling basin, through which the sewage is expected to filter.

3. A series of arches of soft brick . . . through which it is intended to filter. . . .

The wall of gravel at one end of the settling basin is the anaerobic filter of to-day.

As to knowledge of Glover's next remarkable invention, the anonymous anomaly forming a part of the Brockton sewage disposal works, planned and designed by Glover and built by his friend and pupil in 1893, we are indebted to the documents submitted by, and the evidence of, said friend and pupil. It is one of those masterpieces of human ingenuity, diplomatic if not Machiavellian in purpose and design, that is destined to give its inventor a lofty niche in the Temple of Fame.

To the State Board of Health it is a reservoir for the storage of the night flow of sewage.¹

To the pupil-builder it is a settling tank, differing from other settling tanks only by addition of an "agitator."

The leading technical publications, not knowing, have mistakenly called it a septic tank. There is too much danger of explosion from emanating gases, as at Saratoga, to warrant its use as a septic tank.

It was designed by Glover to act as the primary filter bed of his system of rapid filtration, that was taking form in his fertile brain; and it has been used as a primary filter bed for long periods of time.

Glover's last invention of a system of rapid filtration was the crowning effort of a long life devoted to the public good; he discovered that the first one of his series of tanks of his 1882 ap-

¹ Report, 1895, p. 605.

paratus would not only dispose of the sludge but would filter or purify sewage; and he adopted for it the name of "primary filter bed," — the first step of the sewage in his system of rapid filtration, the very name implying the well-known bacterial action in any filter bed. Glover called the action, going on in bed to dispose of the sludge and purify the effluent, *primary filtration*.

When a water-tight tank is charged with sewage it is a cesspool; when a cesspool is constructed to separate, arrest and retain the solid and the greater part of the offensive matter, and permit the effluent to escape clarified and partially purified, it is Glover's primary filter bed, having provision for the removal of the gases into which the "solids and liquids" are converted by putrefactive action, not due to the absence of air but to the presence of water. The provision for the removal of offensive gases is an important feature of Glover's invention; but probably the most important feature of the invention, aside from the complete filtration or purification of the contaminated water and the partial bacteriological decomposition and disposal of the sludge, disclosed by the construction and use of the apparatus, is the use of small filter beds and the reduction in the cost of constructing the system.

The court find: —

It is possible there may be some septic action in this filtering-bed receptacle, just as there may be some action of this character in the ordinary settling tank. This, however, is immaterial, the question being whether these beds were intended to operate as septic tanks.

The bacteria that enter into the process of filtration are broadly subdivided into three classes, like the rest of created nature; the aerobic bacteria are in the air above us; the anaerobic bacteria are in the earth or water beneath us; the facultative bacteria are everywhere.

Aerobic bacteria are held responsible for the action going on in our outside secondary filter beds, known as nitrification, or slow sand filtration.

To use our apparatus for rapid filtration we are obliged to depend upon the action of bacteria, aerobic, anaerobic or facultative; and as the former permits rapid filtration under no known conditions, we are obliged to look to the two latter for the rapid action.

Facultative bacteria acting as anaerobic bacteria for the filtration of water are to all intents and purposes anaerobic bacteria;

therefore to obtain the rapid filtration which the court find our patent discloses we must depend upon the action of anaerobic bacteria.

The action of anaerobic bacteria is septic action, a living ferment due to the absence of air, as Pasteur thought; to the presence of water, as Glover thought; commonly called putrefactive action, or putrefaction, or rot, for short.

The septic tank is one thing, the court have fixed that exactly to the satisfaction of everybody, including the inventor of the name if not of the tank itself; septic action is quite another thing, and it is not confined to the air-tight septic tank, with its submerged inlet and outlet pipes, but is present whenever and wherever organic matter is putrefying, and most active under the favorable conditions offered by moisture in the atmosphere or in fresh running water confined in a tank.

Therefore, as the patent discloses to the court that the construction and use of our primary filtering-bed receptacle indicates the possibility that there may be some septic action therein, as in an ordinary settling tank; and as the patent provides for the presence of an optional settling tank outside of the primary filters; and as by no possibility can the primary filter beds specified by patent act as settling tanks; and as the primary filters are to rapidly filter the sewage; and as anaerobic bacteria are the only known agents causing rapid filtration; and as some anaerobic bacteria or any anaerobic bacteria are all that are required to seed or impregnate a primary filter bed, and make it operative as a rapid filter,—we understand that the court, in finding any septic action in our primary bed, find all that we rely upon for the action of our system of rapid filtration.

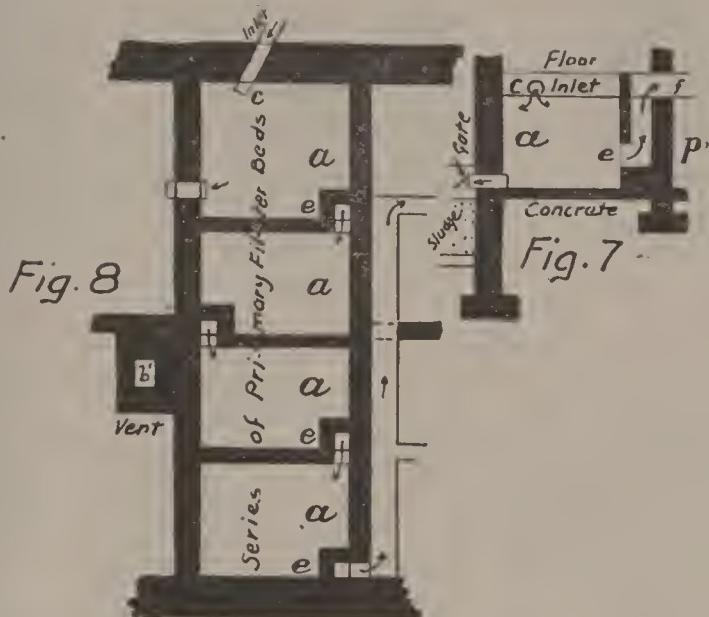
One of the most eminent sanitary and civil engineers in the world, who refused to act as our expert but consented to give the court all the information on the subject he could, testified: "What is to-day known as the septic tank is a structure in which there is a mechanical separation of the matter in suspension from the liquid sewage, which is the same claim apparently made for the primary filter beds."

It follows by finding of court that what is known to-day as a septic tank, except Cameron's tank and Mouras's "glorified cess-pool," should be known as a primary filter bed.

It appears in evidence that one of the leading instructors in this country several years ago adopted the name as appropriate and fitting.

BRENTWOOD PLANT.

The court, in finding that the patent, while not disclosing the process and not a process patent, and not for a monopoly of a process as old as creation, discloses the invention and is for an apparatus for rapid filtration, construe the patent for the broad



BRENTWOOD PLANT.

invention of rapid filtration, if, as is the case, rapid filtration can be obtained only by the use of the apparatus constructed and used in the manner specified and disclosed by patent.

The public will recognize the justice and equity of this finding of the court when informed that Glover not only made the discovery and invention, and disclosed it in his patent, but personally, in his very old age, built his apparatus for rapid filtration at Brentwood, N. H., — the first apparatus built in any part of the world for rapid filtration.

From careful experiments conducted elsewhere with a similar plant it is found that the sludge is reduced by retention in the primary filter from 25 cubic feet of dry organic matter per million gallons treated to 3 cubic feet; and that where ordinary sludge carries from 92 per cent. to 98 per cent. moisture, the solid matter deposited in these beds, when removed from time to time, carries 60.9 per cent. moisture.

The important discovery disclosed by this Brentwood plant, as

well as by the patent, is the mechanical separation of the matter in suspension from the liquid sewage in the primary filter bed, and the rapid filtration of the clarified and partially purified effluent in the secondary filter beds.

It may be added that the Brentwood plant is as efficient to-day in the rapid filtration of sewage as it was when built, nearly eleven years ago.

The opinion of the court that Glover's mind was running in the direction of intermittent filtration; and the opinion of the Massachusetts State Board of Health, perhaps the most eminent authority in the world on the subject of filtration, that "there would be a constant flow of sewage through the proposed (Glover) tanks," is reconciled by the fact that the Andover plans and the patent itself show what is now called "intermittent continuous filtration."¹

FIRST GLOVER PATENT.

When the first Glover patent expired by limitation, May 30, 1899, the invention and discovery therein disclosed became the property of each and every citizen of the United States, to own, to use and to defend, like any other property, and safeguarded by the laws of his country. It did not disclose the absurd "septic tank," or the absurd bacteriological treatment of sewage therein, by which "the solid portion of crude sewage is entirely thrown into solution."

The invention disclosed by first patent had for its object to enable sewage matter, or the suspended matter, or the so-called sludge, to be disposed of by letting the liquid flow through a series of tanks, depositing in each a part of the matter held in suspension. "During spontaneous subsidence, which is a much slower process than precipitation, fermentation sets in. Solids are converted into liquids, and both solids and liquids into gases," ample provision for which is made by the patent.

The finding by the court, that the first Glover patent does not disclose the septic tank, is liable to convey the impression that Glover was not the first man in the world to intentionally utilize putrefactive action to dispose of sewage sludge in the only reasonable and effective way.

It may be possible that the court intended to find that Glover did not disclose by his first patent how the matter deposited in

¹ Report. 1895, p. 60.

tanks was disposed of, or how much of it was disposed of. Glover provided the tanks, with an inlet and an outlet, and a flow of sewage, and nature does the rest; and that is all there is to an apparatus utilizing putrefactive action for the disposal of municipal sludge; and that is what Glover's first patent disclosed to his countrymen, and is or should be common property to-day.

We have an added interest in the patent from the fact established by it that Glover was the discoverer and inventor of the process, or the utilization of the process, that makes possible his later system of rapid filtration.

BACTERIA.

The anaerobic bacterium seems to be a product of animal life almost universally but not always present in sewage, quick to grow, rapid in action, requiring food and fresh water, disappearing when its work is accomplished, easily killed, and readily transplanted from one tank to another.

There is no difficulty attending the development of the anaerobic bacteria; care and an infinite amount of trouble must be taken not to develop them. An unwashed milk can will bring them into being. They are nurtured by filthy conditions and are banished by cleanliness. They are closely allied to all forms of disease germs, and travel from place to place on the foot or the wing of an insect. They lodge on the point of a needle or the blade of a knife, and must be removed to make modern surgery possible. They are classed as species of vegetable life of a very low order, made up of a cell; and now they are known they are dreaded much more than carnivorous beasts of the African jungle.

No wonder the State Board of Health forbade and condemned their employment for years in sewage disposal, in fear lest the use of such agents bring harm to the people.

Offensive, repulsive and shunned, attending death and corruption, a menace to man, the anaerobic bacteria were accorded a valuable place in the workshop of nature by Glover, who discovered their use and harnessed their terrible power for the welfare of man in the rapid filtration of water.

These little micro-organisms named bacteria come into our apparatus to cause rapid filtration. Whence they come or whither they go, no man knows. They are an army of life cells, of all sorts and conditions. Dr. Stephens, the biologist, says: —

Although the size of cells differs considerably relatively to each other in different tissues and situations, the difference is mainly within certain definite limits; and the general type and form are unmistakable and apparently unchangeable.

The cell of life was formerly regarded much in the light of a *modicum* of pure protoplasm, which latter substance in turn was supposed to be structureless.

We now know that a cell may be something very complex. It is, in all probability, the seat of a well-nigh infinite organization of the sentient, living particles, aggregated, in-wrought and collocated upon a plane of growth and development far beneath the reach of the microscope at present. Not otherwise could it be the theatre of such hereditary effects as we now clearly perceive it to be; effects which have been garnered there during many millions of years, not one of which seems ever to have been really lost, or fails, even after centuries of passivity, to be able to reappear.

This army comes into the first tank of Glover's first apparatus a million strong to every cubic centimeter; and the first thing they do is to increase their own force to 50,000,000 to the cubic centimeter; and then commences the battle for the benefit of humanity. It wages fiercely, and our enemies are almost eliminated, but in the strife our allies are almost annihilated, and the noble army escapes from the field of battle with its number reduced about 85 per cent. of what entered the tank. In the strife the dissolved oxygen in the liquid that makes fish life possible is entirely exhausted, and the gases or the smoke of battle is carried to the upper air.

When the liquid overflows from the first tank to the second in a thin film, the thirsty water absorbs from the fresh air drawn over it all the oxygen it requires to give new life and energy to the escaping army of warriors; and the fight goes on to entirely eliminate our enemies, only differing in name. It is now called nitrification or oxidation.

In the third tank the process is repeated, the terrible anaerobes having entirely disappeared, and, in a large measure, the amphibious facultatives, leaving the strife to the slow acting aerobes, as in any stream of running water thoroughly aerated.

If the last two tanks hold the flow of twenty-four hours, the effect on the liquid is the same as if it flowed in an open stream for twenty-four hours; and if current of stream had velocity of

two miles an hour, it would be the same in tanks to effect purification as if the liquid flowed in stream forty-eight miles.

It is a well-known fact to-day that Glover was right in stating that the effluent would pass from his last tank to the ground or to a suitable conduit in a practically pure condition,—such as at Lawrence is converted into drinking water for a city.

Glover's first apparatus was not the unscientific "septic tank;" but it was a wonderful and scientific invention to rapidly remove from polluted water the greater part of the offensive matter.

It is an established fact from evidence of defense in suit, that Glover recognized bacteria as the active agents in his tanks to dispose of sewage sludge and make possible his rapid filtration in 1891; but his neighbors and friends give the date of this knowledge of Glover's as 1881. In any event, he was the pioneer to recognize and apply bacterial action in the disposal of sewage in the rapid filtration of water.

The patent specifies what is to be done with the insoluble matter deposited in the various tanks of the system; for while it was being removed "the disposal of sewage (sludge) was going on at the same time in the other wings."

The whole scientific world to-day practically concedes to Glover the credit of making this discovery and invention of the preliminary treatment of polluted water, to permit its rapid and complete purification by subsequent treatment.

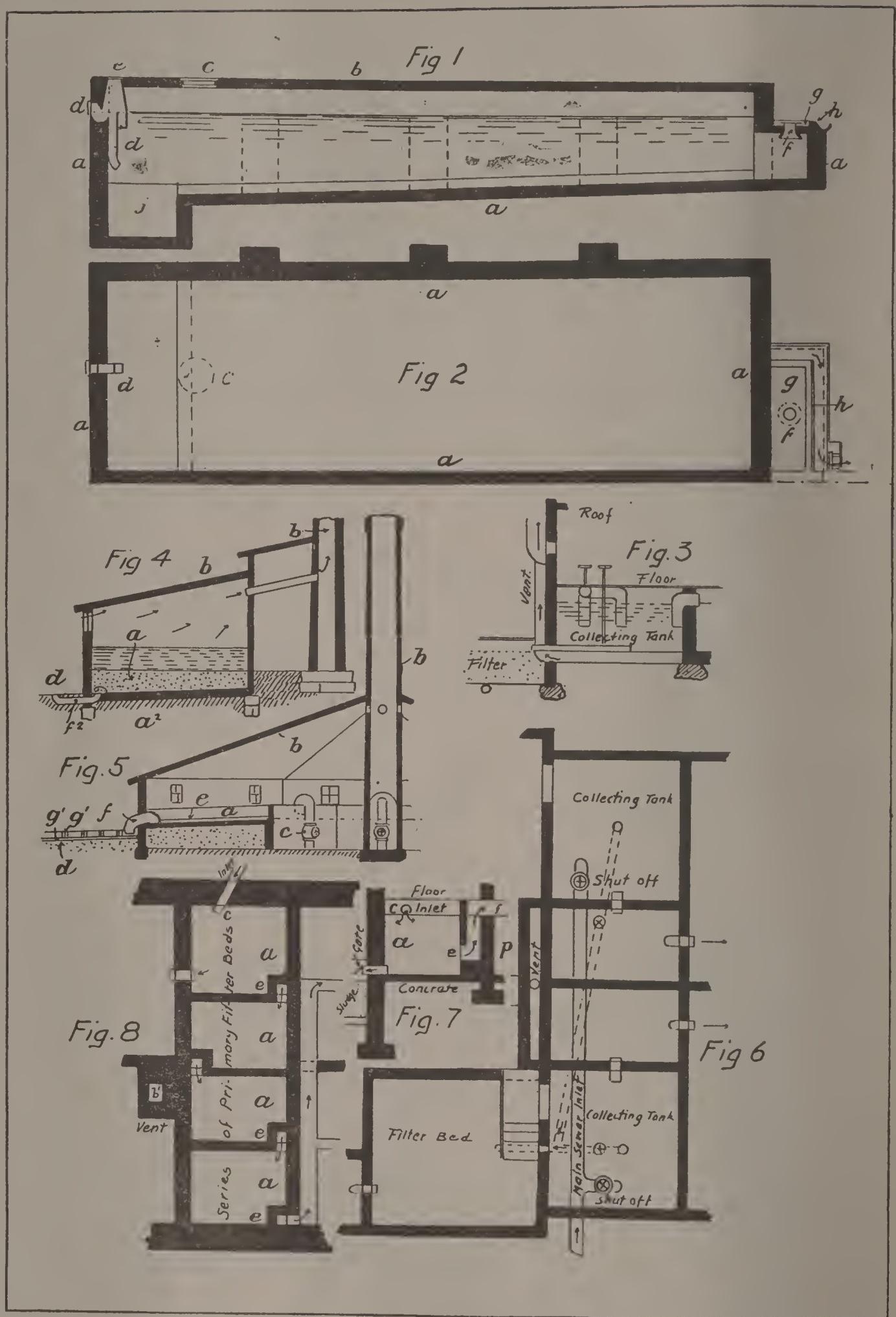
CHRONOLOGY.

Glover submitted his Andover plans for system of rapid filtration August 1, 1895; on record in State archives, with report dated August 5, 1895; fully described as to construction and use in report of Massachusetts State Board of Health for year 1895, pages 59–62.

Glover applied for his second patent for a system of rapid filtration September 23, 1895.

The Glover system of rapid filtration as exemplified by the Andover plans was disclosed to the public in the "Boston Herald," October 4, 1895, by a popular and technical article, clearly indicating the construction and use of apparatus to effect rapid filtration.

The town of Andover received from the State authorities a report on plans October 10, 1895.



Figs. 3, 6. Glover's Andover Plan, Aug. 1, 1895.

Figs. 4, 5. Glover's Primary Filter Beds, Sept. 23, 1895.

Figs. 1, 2. Cameron's Septic Tank, Nov. 8, 1895.

Figs. 7, 8. Glover's Brentwood Plant, Dec. 4, 1895.

The English patent for the Cameron tank, a copy of Glover's Andover tank, without the ventilation and the small outside filter beds, was applied for November 8, 1895.

December 4, 1895, Glover and associates entered into a contract to build the Brentwood works for rapid filtration.

February 26, 1896, Glover's system of rapid filtration at Brentwood was in working order, and was visited by a concourse of prominent citizens, an account of the visit, the names of the visitors and an account of the works being in the "Boston Herald" of that date.

Early in year 1896 an illustrated pamphlet was issued, disclosing the construction and use of the Glover System of rapid filtration, thus:—

The sewage is received through the main sewer entering the structure, thence through branch pipes controlled by gates to either set of collecting tanks and filter bed, so that an *intermittent flow* may be maintained. The sewage received in the larger collecting tank is clarified by sedimentation, depositing here most of the sludge, and passes on to the smaller tank, where nearly all the remainder of the organic matter held in suspension is removed; thence the sewage flows upon the filter bed, holding all the organic matter in solution but little in suspension.

February 28, 1896, a digest of the "Herald" article of October 1, 1895, explaining the construction and use of the Glover apparatus for the Glover system of rapid filtration, was sent to the Patent Office.

April 3, 1896, the second Glover patent, which had been three times rejected, was allowed.

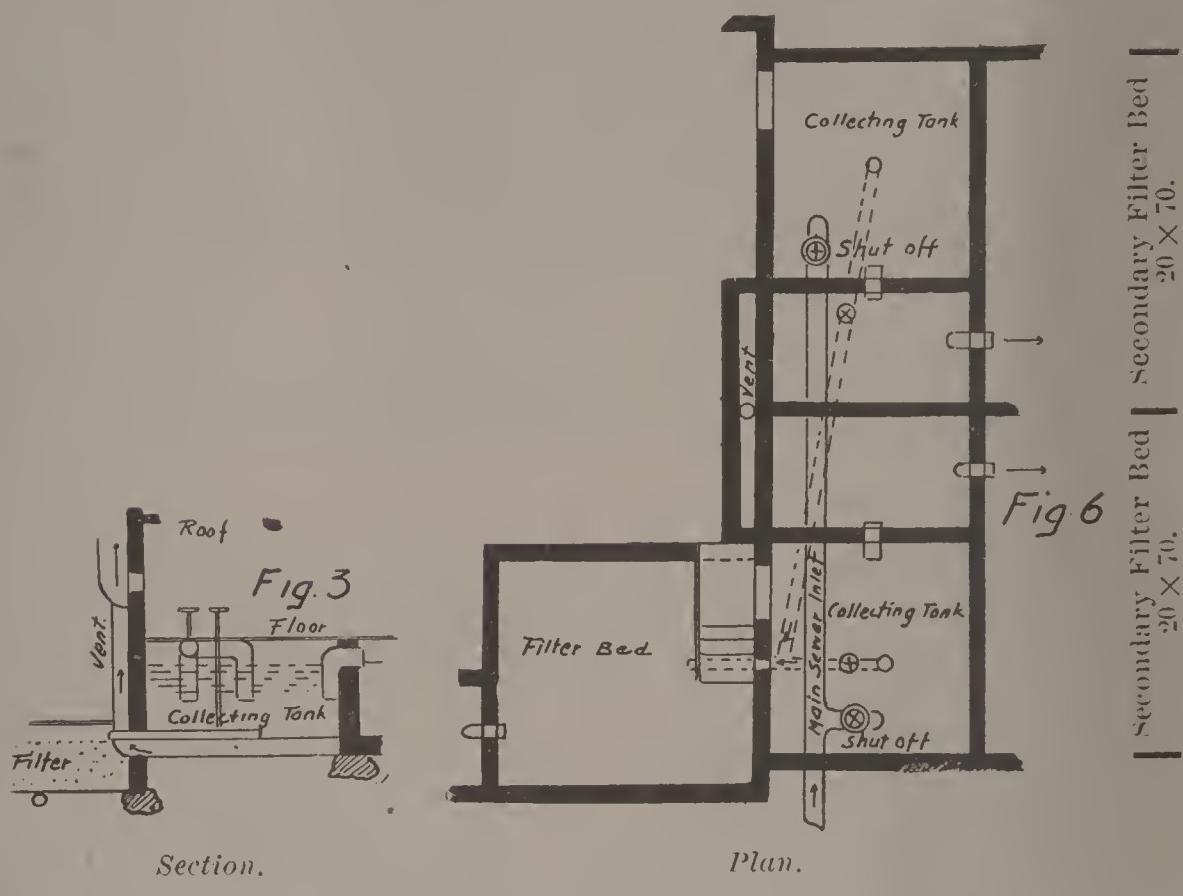
May 5, 1896, the patent was granted.

INFRINGEMENT.

The court might have found that the Cameron "septic tank," clearly describing the septic process by its construction and use, was anticipated by the primary filter beds of the Glover second patent, as well as by the Mouras "Automatic Vidangeuse," and by the ventilated tanks of the apparatus specified by the first Glover patent, which was the pioneer in utilizing putrefactive action in the disposal of sludge.

The court also might have found that the defendant's apparatus, instead of being a septic tank, is to all intents and purposes the primary filter bed of the second Glover patent.

It may be stated as a fact, established by the evidence of both parties in the suit, that defendant's apparatus was not built for rapid filtration, and is not used for rapid filtration; for which



reason the court may have found that the apparatus, not being constructed or used for rapid filtration, is not of a suitable construction to cause it to infringe.

SUMMARY.

While from well-established data in the art of filtration it is possible to demonstrate that rapid filtration can only be obtained by means of the Glover apparatus, and by the Glover apparatus utilizing the well-known process of oxidation in the secondary filter beds and the newly discovered rapid anaerobic action in the primary filter bed; and that the Glover apparatus cannot act for slow filtration under any conditions, and if it acts at all it must act as a rapid filter for rapid filtration,—it appears to be a reasonable and legal deduction that the inventor of such a remarkable and valuable apparatus must have intended it to operate in the only way it can operate.

Now, as Congress, acting under constitutional authority, has

enacted the law that the inventor or discoverer shall disclose "the manner and process of making, constructing, compounding and using" his invention or discovery, "in such full, clear, concise and exact terms as to enable any person skilled in the art or science to which it appertains, or with which it is most nearly connected, to make, construct, compound and use the same;" and as the court, having had the evidence of the most eminent practitioners of what may be termed a new art or science laid before them, thus becoming skilled in the art or science to which Glover's apparatus appertains, have found that the Glover apparatus is intended for a system of rapid filtration, it appears to be a reasonable and legal deduction that the court intended the apparatus to operate.

Now, as the laws of nature, disclosed to those skilled in the art of filtration, by costly experiments carried on for a long series of years, prevent the Glover apparatus from operating in any other way than by the use of an anaerobic filter in the ventilated structure, in combination with filtering beds outside, it appears to be a reasonable and legal deduction that the court intended it to so operate.

To assume that the court intended that the primary bed in one form of apparatus specified should act as a contact bacteria bed, filling up slowly with sewage, and when full discharging the effluent upon the secondary filter beds, and that the anaerobic action that makes this use possible is to take place in the optional settling tank, is to read into the patent the optional settling tank performing the specified functions of the primary filter bed.

To assume that the court intended to give a broader meaning to the term "septic tank" than they do give, when they find that the Cameron patent clearly describes the "septic tank," and intended by the term to include any receptacle affording the proper conditions to bring about rapid putrefactive action, such as the tanks of the first Glover patent and the primary filter bed of the second Glover patent, is illogical and untenable, for the reason that the court state explicitly that the first Glover patent does not disclose the septic tank, and inferentially that the primary filter bed of the second Glover patent is not a septic tank.

To assume that the court intended to find that the tanks of the first Glover patent, which are not septic tanks, do not disclose septic action as defined by the court, whereby "solids are converted into liquids, and both solids and liquids into gases," when

the specified apparatus in working order emits only "practically pure water" and offensive gases, is untenable, for the court find that "if any portion of the sewage is permitted to remain for a considerable time in such a tank there will be more or less fermentation, and this would be true of the Glover tanks;" and if the solid and offensive matter of the sewage remain long enough in the tank to become separated from the liquid matter, and permit of its escape in a practically pure condition, we get all the septic action we want as a beginning of our system of rapid filtration. We have no further interest in the sludge, and leave it in the tank to take care of itself.

To assume, as do our friends in the Third Circuit, that the court — who have found that the second Glover patent discloses the discovery and invention of a system of rapid filtration, which is the very gist of the patent, the function that gives commercial value to Glover's apparatus, and the object aimed at by hundreds of inventors for the last fifty years; who have received the disinterested evidence of those most eminent and most skilled in the art of rapid filtration in this country, where the idea had its birth, as to how the Glover apparatus is to be constructed and operated in accordance with the specification and claim of patent to obtain rapid filtration; and who were led thus broadly to construe Glover's patent as covering one of the inventions most important of modern times, and the most conducive to the public health and welfare, by said evidence and by the mass of evidence secured from the archives of this and other countries — intend to take from the primary filter bed of Glover's apparatus the putrefactive action or motive power that makes the apparatus operative, or enough of such action requisite to make the bed inoperative, when the patent discloses to the court that "it is possible there may be some septic action in this filtering-bed receptacle" of Glover's, although evidently the court do not see quite so much septic action in the bed as do experts who have devoted years to the study of the subject and the practice of the art of rapid filtration; and intend to give the credit of discovering the value of utilizing putrefactive action in obtaining rapid filtration to a syndicate of foreigners, who had ample time, after the "Boston Herald" published to the world a full and technical account of Glover's discovery, invention and apparatus, — an American patent for which was then pending, and which was granted upon the strength of the disclosures made

in said "Herald" article,—to have become familiar with the facts set forth in said "Herald" article, and to have applied for a very defective English patent, partly but not fully and correctly stating Glover's broad and correct ideas on the subject of rapid filtration as disclosed by his second patent,—is to assume that the court are in error; whereas we are firmly convinced that we shall eventually demonstrate to our friends in the Third Circuit that they and not the court are in error in regard to rapid filtration; for Glover's apparatus for rapid filtration is a thing of life, an organism with a circulation, digestive functions, lungs, demanding fresh water, food and air for continued activity, the nearest approach by man to the creation of a structure endowed with life, and dependent upon life for its functional activity, even if the life seen dimly by the court and in very small quantities in the primary bed of the apparatus is of the very lowest order in created nature, yet clearly differing from the life found by the court in the outside beds, the whole designed by inventor and recognized by the court as an apparatus to accomplish the rapid filtration of polluted water.

To assume that the court find that the patent discloses Glover's system of rapid filtration; and find that the Glover apparatus described in his patents can be made to operate, in the present state of the art, to obtain rapid filtration, and could have been so operated at Andover had Glover's plans been accepted, and has so operated at Brentwood continuously from February, 1896, to the present time, to obtain rapid filtration; and find that the Brentwood plant was the first plant in the world to use rapid filtration; and find that the Glover apparatus for rapid filtration is not for rapid filtration, and not for filtration of any kind, and for a thing of no known use,—is to assume that the court are in error either as to the rapid filtration or the manner of obtaining rapid filtration.

We believe that the court are not in error; and that in construing the second Glover patent "for a system of rapid filtration, comprising two series of filter beds," the court do not, and do not intend, to limit the method of operating the apparatus.

We do not claim that the first Glover patent discloses the septic tank as defined by the court, or that the second Glover patent does so, but we do claim that both patents disclose to the public and to those skilled in the art of filtration not only septic action as defined by the court, but the most perfect conditions for bringing about

rapid putrefaction by the retention of the putrefying solid and the greater part of the putrefying offensive matter in beds charged with sewage, and having provision for removal of offensive gases emanating from putrefaction; and that Glover is entitled to the credit of discovering and applying this force in nature to cause and to effect rapid filtration.

CONCLUSION.

The court have construed our basic patent, the Glover second patent, for a system of rapid filtration. It is immaterial whether Glover was the inventor of the septic tank or embodied this tank in his patented apparatus; what is material is the finding of the court that the Glover apparatus is for a system of rapid filtration.

As patent specifies, "this invention has for its object to permit the filtration of sewage;" and the secondary filter beds are "adapted to complete the purification;" the word "filtration" is used by the court as in the patent, as a synonym for purification.

The purification of sewage, the removal of the offensive matter that pollutes and contaminates water, is one of the most important arts of the present century; and, provided that Glover does not disclose to the satisfaction of the court in his second patent just how the sewage is treated in the first compartment of his apparatus to bring about the final rapid filtration, Glover does disclose to the court, and to the public, an apparatus to be used to obtain rapid filtration as a whole,—*the* only apparatus that has yet been invented to obtain rapid filtration.

We believe and therefore assert that the court in construing the second Glover patent for a system of rapid filtration, comprising two series of filter beds, one in a ventilated structure and the other outside, while not intending to let the patent cover the combination of beds utilizing putrefactive action and beds utilizing oxidation for any rate of filtration,—the court did intend to construe or have construed the patent for covering the combination of the two natural forces when the same are utilized for rapid filtration; and do so construe it, not only for sewage, but for less contaminated water; in either of which lines we shall contend the discovery and invention were not anticipated. Lastly, that in construing the patent to cover primary beds in a ventilated structure, the court give us the monopoly of primary beds of such construction and use in combination with secondary oxidizing filter beds when the two are used to obtain rapid filtration.

PROPHECY.

As the corporations owning the patents for a system of rapid filtration have already expended over \$50,000 to have their basic patent construed by the court of last resort in patent cases to cover their system, it may reasonably be predicted that, having gone so far, they may be relied upon to press their claims against individuals, corporations or municipalities using their system, granted by the government and sustained by the court, when such system is used without the proper license from owners.

CHANGE IN PATENT.

Some time in the last century, when the Glover patents first came into our possession, we applied for permission to make one change,—to make what we believed were Glover's intentions clearer to the public. We believed Glover intended midway inlet and outlet pipes for one form of his apparatus; and when he read the clause (pp. 1, 73–75), “the effluent enters said pipes only through the porous wall of the pipes, which may be of unglazed earthenware,” he understood the wall of the pipe acted like the wall of a conduit or canal to direct the flow of the effluent. We were informed by a senator of the United States that it would require an act of Congress to make the change; and that such an act was quite impossible to obtain.

If an American patent disclosing a discovery and an invention cannot be reissued, it would seem just and legal that a foreign patent reissued in the United States should correspond in word and drawing, and even punctuation, with the original document.

Cameron's original English patent does not use the words “septic tank,” or the words “septic action,”—they were later discoveries than were disclosed by his first patent, which disclosed his invention of the bacteriological treatment of sewage in an air-tight tank, with submerged inlet and outlet pipes, since called a septic tank.

When an absolutely new art or science is invented and discovered, it requires the coining of new words or a new meaning given to old words to describe it; and when it is an art or science of such magnitude that whole volumes and many of them have been exclusively devoted to it, it is a very remarkable fact that the attorneys, who obtained the granting of the patent, and who from their calling could not possibly have been skilled in the new art, should

have obtained from discoverer and inventor sufficient knowledge of the new art or science to disclose it to those skilled in the art to-day, to the court and to the public, in little over one page of the basic patent.

CAMERON SEPTIC TANK COMPANY.

We desire to treat a brother corporation with all due consideration; but when our brother appropriates our apparatus, and puts a lid on and claims it as his own, because he informs the public that there is rot in our tank which any child would recognize, we object.

On the assumption that the Cameron air-tight tank would accomplish all that the inventor claimed in his patent, by merely closing the orifice of the Gloyer 1882 apparatus to prevent the admission of air to aid in the removal of gases emanating from matter in the tank, it would have been an improvement upon the Glover 1882 apparatus, and would have been entitled to protection; but, as a matter of fact, the Cameron tank is a retrogression in the art of sewage disposal to the 1882 glorified cesspool of M. Mouras, and does not equal in efficiency and safety of operation the Glover 1882 apparatus for the disposal of the sewage of a town or city. About ten of Glover's ventilated primary filter beds are in use in Great Britain to-day, estimated by capacity, to one "septic tank;" and the manner specified by Glover for the removal of suspended matter deposited in both the ventilated tanks and in the "septic tanks" is in common use in all parts of the world.

It was bad enough to call the rot in our tank "the bacteriological treatment of sewage," but when our brother later attempts to call our *primary filter bed* by the nasty and putrid name of "septic tank," we object; and the court have sustained our objections, and have established the law in the United States that the "septic tank" is what Cameron claimed it was,—an air-tight structure with submerged inlet and outlet pipes.

When our brother advertises: "The Septic Tank System of Sewage Disposal (Patented) Patents the Process of Septic Treatment in Open and Closed Tanks," we believe our brother is misleading the public in a very serious matter, and again we object. And we propose to object with the big stick of the law to alien interference with our corporate rights, granted by Congress.

We confidently expect to administer the Hessian treatment to our foes, and to give *their* "septic treatment" to their claims, where only it is operative.

BUSINESS.

Our business was established twenty-five years ago last month, when the discoverer and inventor, Amasa S. Glover, applied for his first patent. He had made a notable discovery; but he did not stop there; he progressed. He kept far ahead of his time. He experimented; he made new discoveries. His last and crowning achievement was the discovery and invention of a system of rapid filtration, which was made just before he died, at the age of eighty years.

We took up his life work soon after his death, and have endeavored to promote his inventions. We have invested, as did Mr. Glover during his life, many thousands of dollars to establish this business.

It is true that we might have gone to the court with the patents alone, and have claimed and proved our right to the monopoly; but, as this invention of Glover's involves an engineering proposition, we deemed it wisest to prove to the engineering profession, outside of the patent, that Glover was entitled to the credit and rewards of the discovery, while making out our case for the court.

An engineering proposition is like a problem in mathematics, and can be demonstrated; and when it is demonstrated to the satisfaction of some of the most prominent civil engineers of the United States, it becomes with the engineering profession of the whole world an established fact.

OUR SYSTEM OF RAPID FILTRATION.

Consider, if you please, what our system of rapid filtration will do for your own home or for your city.

It will receive the waste organic matter and so reduce its bulk that it may be composted without causing offense, and completely dispose of the offensive matter, emitting a sterilized effluent. It separates, arrests and retains the solid and offensive matter and utilizes the same to produce filtration and purification in the most rapid, natural and inexpensive way ever dreamed of, and in a way so complete that it has no rival. It is more effective than slow filtration; for no pathogenic germs ever escape after once entering the apparatus. In time it is bound to eliminate such germs from the community where the system is in use. It gives the community the boon of perfect drinking water, rapidly, perfectly and inexpensively filtered and purified.

This system of rapid filtration has been recently adopted by the great city of London and many other large cities in Great Britain, by several American cities, and is coming into general use.

We solicit your business, and the business of your community or city. We are prepared to advise you how to rapidly filter water or sewage, how to construct works for rapid filtration, to supervise construction, to make the works automatic in action, and, as far as possible, fool-proof, and built to render efficient service,—for a reasonable compensation in the form of a royalty.

We specially ask the co-operation of the press to give publicity to what our system of rapid filtration will do for a community.

We ask the co-operation of civil and sanitary engineers and of the State and local health authorities in promoting our discovery and invention for the public good.

We ask investigation by city and town officials as to the merits of the system protected by our patent as construed by the court.

Parties using our apparatus without license from us are hereby warned. Correspondence solicited.

That due weight may be given to the statements hereinbefore made by corporations, we have authorized our chief executive officer, a man skilled in the art or science to which the subjects treated appertain, to appear before a justice and swear that, to the best of his knowledge and belief, the above statements are the truth, the whole truth, and nothing but the truth, and are in no way intended to deceive or to mislead the public.

THE AMERICAN WATER PURIFICATION COMPANY,
By DAVID H. JUDD, *Treasurer.*

THE AMERICAN SEWAGE DISPOSAL COMPANY OF BOSTON,
By JOHN N. MCCLINTOCK, *President and General Manager.*

OFFICE, 643 OLD SOUTH BUILDING, BOSTON, MASS., U. S. A.

JOHN N. MCCLINTOCK.

STATE OF MASSACHUSETTS, COUNTY OF SUFFOLK, ss.

On this twelfth day of November, 1906, personally appeared before me, a notary public, John N. McClintock, who, being duly sworn according to law, deposes and says that the statements set forth as above are true.

JOSEPH W. BARTLETT.

(SEAL.)

STATEMENT AS TO FACTS IN EVIDENCE, AND EXPLANATION.

It may be interesting to those skilled in the art of rapid filtration, and to the public, to have a view of the evidence that was laid before the court, which led the court to construe the second Glover patent broadly for a system of rapid filtration, instead of construing it to cover some particular part of the apparatus or some particular process going on in said part.

It appears in evidence that in January, 1895, the Glover Sanitary Sewerage Company was incorporated, and advertised the company as controlling the Glover patents, the one then issued disclosing how to dispose of municipal sludge, and the one to be issued, for rapid filtration. Glover capitalized his ideas in the form of a stock company; and thereafterwards the ideas belonged to him only as a stockholder in said company. The stock of the company was issued to Glover in return for his first patent and his ideas on the subject that were to be incorporated in his second patent, which the company stated they controlled, and which was transferred to the company very soon after it was issued. Glover's ideas and intentions at the time he transferred them to a corporation is a matter of considerable importance, for what Glover transferred to the Glover Sanitary Sewerage Company in January, 1895, by due and legal transfer, became the property of the American Sewage Disposal Company of Boston, and of the American Water Purification Company, at a later date.

Soon after incorporation the company issued to the public a statement; and as nearly all the stock belonged to Glover at the time of publication, the statement made by the company may be legally construed as emanating from Glover. In said statement Glover expressed himself clearly and fully upon the subject of his system of rapid filtration, as follows:—

GLOVER'S INTENTIONS.

We propose, in this circular, to make plain our plans and methods of the disposal of sewerage by intermittent filtration under the patents controlled by the Glover Sanitary Sewerage Company. . . .

With the aid of our main house or sheds, which contain the tanks and filter beds, we are enabled to turn water pure, or so nearly so into the stream which carries it off that it in no way interferes with its purity or endangers its sanitary condition. The small amount of solids that remain after going through *our process* will be quickly carried away for their value as a fertilizer. . . . We put a portion, or, under certain conditions, all of the filter beds under cover. . . . "The process of purification by intermittent filtration consists of intermingling the sewage in the pores of the filtering material with sufficient air for a sufficient time in the presence of micro-organisms which quickly establish themselves [there]. Sewage filters resemble [complex] living organisms, in that the ventilation and respiration must be maintained, otherwise the[ir] functions are interrupted and their lives as filters come to an end."¹

The foregoing remarks [by Mr. George W. Fuller, the biologist] are significant, as with our process *and* system of intermittent filtration *under cover*, with the currents of air passing *in* and *over* the filter beds, and escaping, after they have performed their work and become loaded with impurities, through the chimney at a high elevation — that is, taking in the heavy currents of pure air and forcing it out when impure — it becomes in reality a living organism.

It will be seen from above quotation that the inventor recognized in his system of rapid filtration "a living organism," a creature which he claimed as his own creation, a thing of life, the offspring of his brain.

Glover, the discoverer and inventor, the original investigator and scientist, started in life as a cabinetmaker, and from his researches in the art and science of rapid filtration he may well be called "the learned cabinetmaker." From early associations in his trade a plan or drawing had special significance to him, and he used plans and drawings freely to disclose his advanced ideas to the public, both in his first and second patents, and in the document under consideration. Fig. 9 shows how Glover intended his apparatus to be constructed when a portion of the filter beds were under cover.

¹ Quotation corrected.

We herewith present a number of cuts illustrating the different stages of disposal.

This system, which is broadly covered by United States letters patent [No. 258744], consists in a combination of a series of tanks; a sewer main or pipe arranged to discharge sewage matter into the first tank of the series, from which said matter flows successively through the other tanks; a building or inclosure over said tanks, having an inclined roof forming a flue, having an opening at its lower end for the admission of

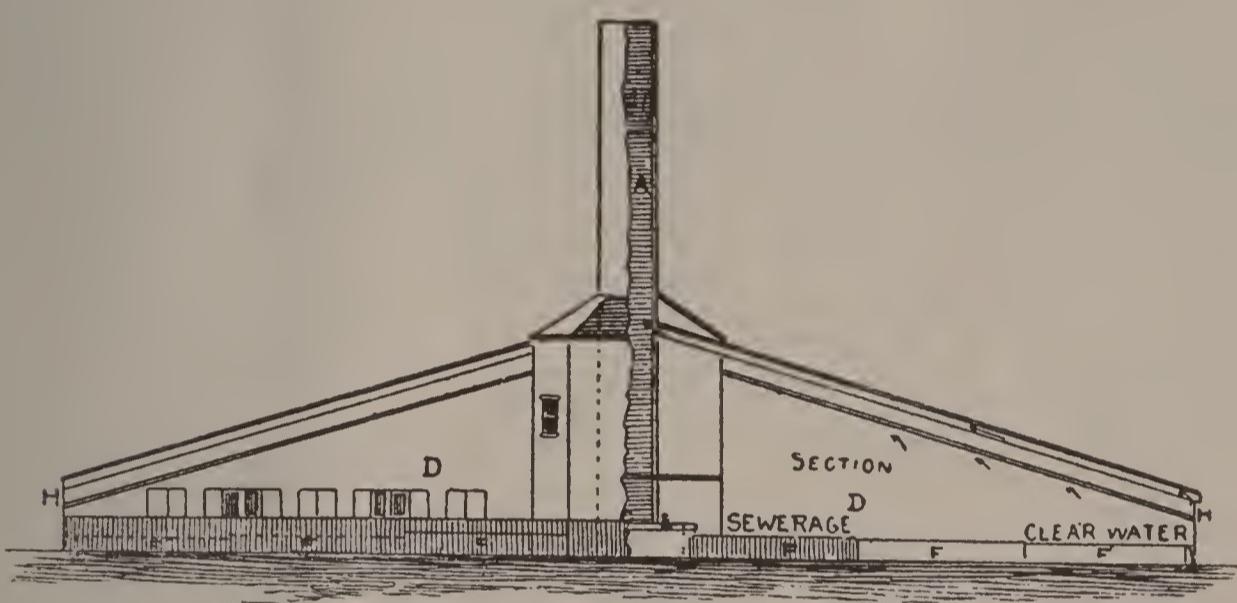


FIG. 9.—INTERIOR, SHOWING SEWAGE BEDS UNDER COVER.

external air; and a chimney connected to the upper end of said roof or flue, said chimney, flue and opening causing a current of air to pass over the series of tanks to the chimney, and carry with it from the building all the gases and odors arising from the matter in the tanks.

The first tank is for the reception and retention of the "sewerage" or sewage; and when the tank has been charged with sewage, the sewage flows thence into the second tank of the series, which is shown in Fig. 10.

Here we have the filtering material resting on a liquid-tight bottom, with underdrains, shown with the sewage standing over the filtering material, so that no air can enter the filter. Its construction clearly indicates its purpose and use in Glover's system of rapid filtration to the way-faring man, as well as to the expert; the sewage must either flow over the filtering material or through the filtering material. If the sewage flows over the filtering material the elaborate construction can be of no possible use as a filter, because it is not used as a filter. Moreover, with sewage standing

over the filter bed, it cannot act as an oxidizing filter bed. With the sewage flowing through the bed it is the anaerobic filter, and will permit the sewage that escapes from the first tank to flow

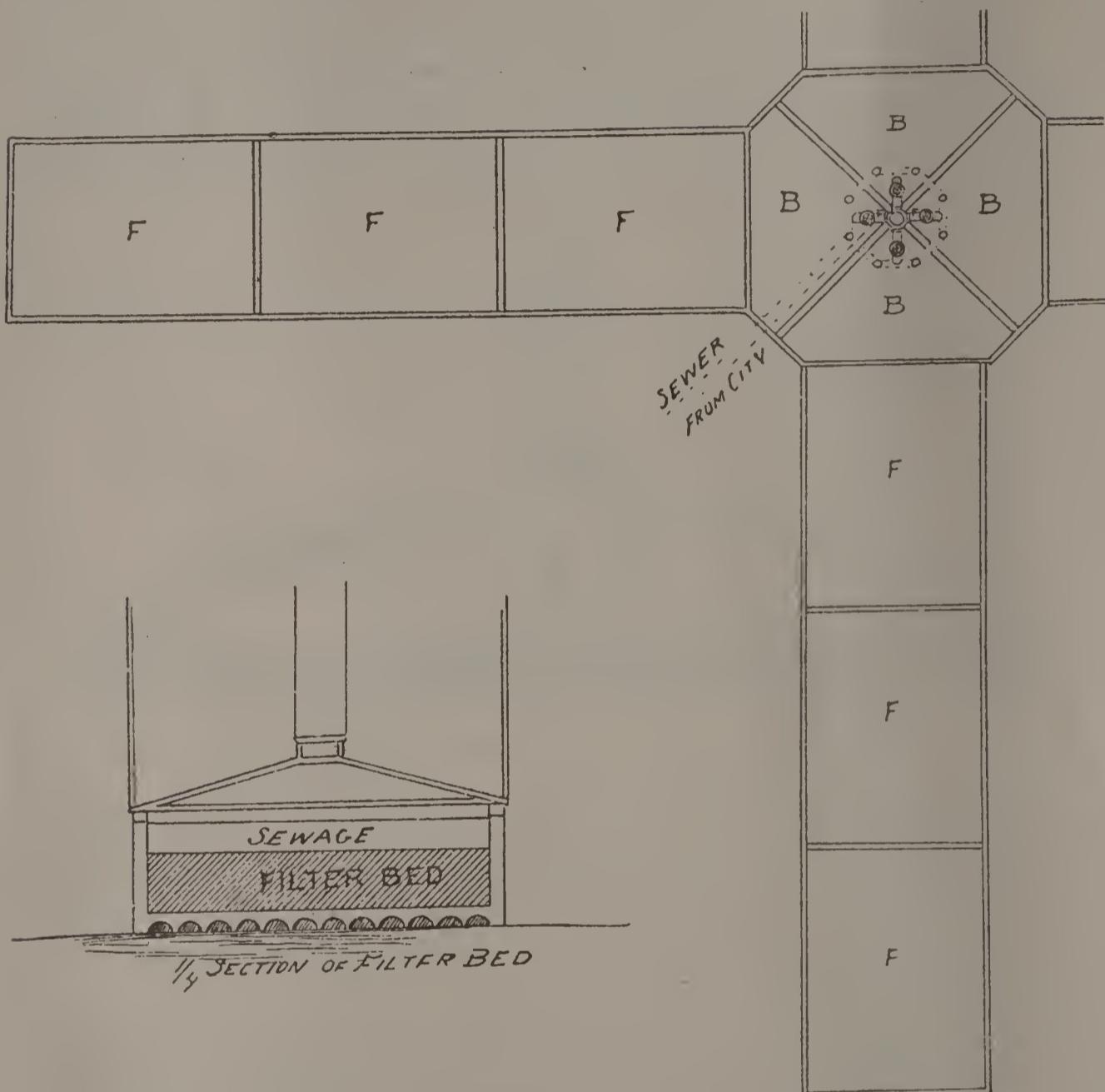


FIG. 10.—SHOWING SECTIONS OF SEWAGE BEDS.
Each wing has a series of tanks F, of any desired number.

through the filtering material at the rate of many million gallons per acre per day,—a million gallons representing the downward flow of 40 inches.

There is no provision for the escape of the sewage from the first tank except through the second tank of the series; and the solid matter deposited in the first tank must be removed from time to time by way of the door communicating with the upper side of the tank. Nothing would be deposited in the second tank, which is an

anaerobic filter through which the sewage flowing from the first tank passes to the third tank of the series.

It will be noted that this third tank holds "clear water," — such as the tank would naturally hold if the sewage had been subjected to the treatment of Glover's process in the first and second tank of Glover's apparatus; and here in the third tank takes place a very important part of Glover's system of rapid filtration, — the sedimentation following anaerobic treatment, or what is called "our process," in Glover's system of rapid filtration. So far Glover had designed the apparatus for rapid filtration before March, 1895. The sewage flowing through the first tank of the series, and depositing therein the bulk of the suspended matter by spontaneous subsidence, passes to the second bed, and down through the suitable kind of filtering material to the underdrains; thence to the third tank of clear water for sedimentation, before receiving subsequent treatment by "oxidizing bacterial action on open-air sewage sand filters."

Glover said: "We put a portion, or, under certain conditions, all of the filter beds under cover."

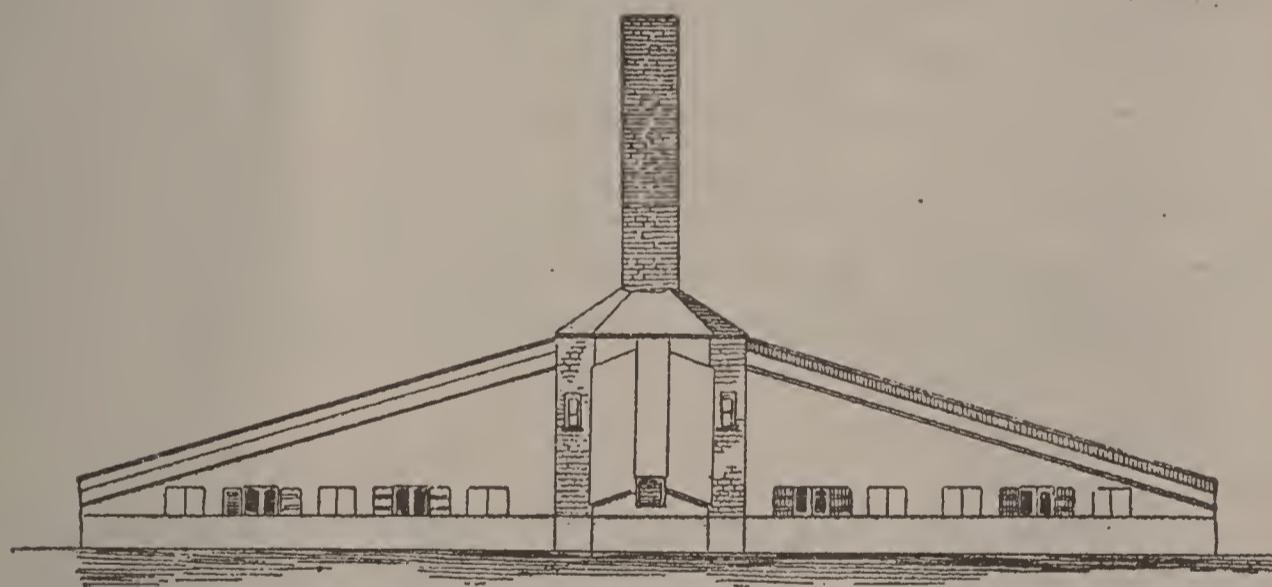


FIG. 11.—MAIN STRUCTURE.

This cut, like the drawings of patent No. 258744, shows all the beds or tanks under cover; as does the left-hand part of the structure shown in Fig. 9.

We come now to the consideration of these secondary filter beds for oxidizing bacterial action, whether they are located in the gas-removing structure, as Glover explains that they may be, or located outside; they are certainly outside of the first three tanks of the series wherein anaerobic action, or what is called "our process,"

is clearly indicated, because no other action is possible therein. Note what Glover said: "With our process *and* system of intermittent filtration under cover . . . it becomes in reality a living organism."

There cannot be intermittent filtration in the first, second or third tank of the series, the last designed for holding clear water; these three tanks were evidently intended for what Glover called his process. Intermittent filtration must be beyond the first three tanks.

The clear water from the third tank comes to the two tanks intended for intermittent filtration, whether located inside or outside the structure.

It is interesting to note in how many ways these two oxidizing filtering beds, located inside the structure, can be used to advantage; for instance, the clear water in doses may be applied first to one bed and then to the other, a heavy current of air being drawn in or through the filter, as Glover suggested; or the beds may be used as trickling filters, the purification increased by the heavy current of air drawn through the filter; or they may be used as contact bacteria beds, one filling up slowly while the other is aerating by the heavy current of air drawn through it. Located outside the structure, they were intended for oxidizing bacterial action, as found by the court.

Fortunately we are not dependent for our knowledge as to how Glover's apparatus, constructed as above specified, is to be used, from its construction; because Glover's friend and pupil explained the use intended by Glover to the society of which he is an honored member, as follows:—

The speaker can testify that Mr. Glover did claim an absolute disappearance of all solids, either in the central tank of the system or the subsequent filters grouped around the tank. He recognized the necessity of oxidation, and provided for a kind of aeration of the filters, and also for periods of dosing and rest. . . . The patent has long since expired, but there are scores of men living who will testify that Mr. Glover discovered the bacterial system of purification. . . .¹

As Glover's 1882 apparatus was the first apparatus ever designed to dispose of or get rid of municipal sludge, so this 1895 apparatus was the first, and is the most perfect ever designed, to effect rapid and complete purification, as found by the court.

¹ Transactions American Society of Civil Engineers, Vol. XLVI (1901), p. 474.

PATENTING AN ORGANISM.

Just think for a moment how difficult it is to specify in a patent just what makes this discovery and invention of Glover's valuable and useful in the art of rapid filtration; it is like specifying a baby or a dog or a fish, or anything else that has life.

This organism of Glover's has life; the life in the tanks was discovered by Pasteur several years before Glover recognized the value and utility of the life in disposing of municipal sludge; and life in such tanks was a matter of common knowledge in 1882, as was the presence of rot, which Pasteur had announced to the world was a life action. Life action in the secondary beds was recognized by Warrington in 1882, and that also was a matter of common knowledge in 1895. In selecting the names of primary and secondary filter beds for the two parts of his apparatus to obtain rapid filtration, Glover in effect announced that the action therein was a life action; and he called the action in his inside tanks or filter beds "primary filtration," and the action in his outer beds "secondary treatment,"—showing that he recognized a difference between the two.

As a matter of fact, it makes no difference whether the rot in Glover's tanks is a life action or chemical process. Glover called his apparatus "a living organism" in his circular; but he hesitated to do so in his patent; for he did not know, and no man living knows to-day, how the life cells operate in making the tanks operative.

Glover submitted this idea, which he had already transferred to a corporation, to the firm of patent solicitors who had secured for him his first patent for an apparatus for the disposal of municipal sludge, and asked them to secure a patent for the same, expressed in the terse language insisted on by the Patent Office.

GLOVER'S APPARATUS.

It is well to remember just what the apparatus to be patented is, how it is constructed and what it is to accomplish. It consists of the five tanks of the Glover 1882 apparatus. In the first tank there is to be no change in construction and use, as is manifestly evident; it is to be charged with sewage, suspended matter is to be deposited and removed when necessary, and the sewage is to overflow into the second tank of the series. The sewage is to flow through the

second tank of the series and through suitable filtering material placed therein, or "wholly through filtering material." The third tank is for the storage of the clear water and for sedimentation. The fourth and fifth tanks are for the well-known oxidizing bacterial action in open-air sewage sand filters, in which or through which heavy or strong currents of air are to be drawn, and thence pass over the other tanks of the series for the removal of gases emanating therefrom. Glover said these oxidizing beds may be within the structure or outside.

Now, what is there to patent about this apparatus, this living organism of Glover's? There are the three tanks in the ventilated, gas-removing structure to avail of his process, and the two tanks inside or outside of structure to avail of intermittent filtration, the five forming a unit, of which purification works require several, for obvious reasons.

In the first place he selects the name for the parts and the name for the processes in rapid water purification going on therein. He is bound to lop off the non-essentials of the apparatus he is seeking to obtain a patent for, such as gates and valves, and such as the third tank for the reception and storage of clear water, thus reducing his tanks in structure to two. The second tank holds the filtering material through which the effluent of the first tank is to escape; and as that may be placed in the first tank to accomplish its functions, the second tank is omitted; and Glover applied for and received a patent for a primary filter bed in a ventilated structure, said bed being constructed to separate, arrest and retain the solid and the greater part of the offensive matter, and to permit the escape of the clarified and partially purified effluent wholly through filtering material, or through proper construction to accomplish the same end, to one secondary filter bed in the open air, the whole forming a unit.

SEPTIC ACTION.

It is immaterial in this connection just what Glover legally disclosed in his first patent. What is important is what he thought he disclosed.

It is evident that he thought he disclosed just what he said in his first patent he did disclose:—

This invention has for its object to enable sewage matter to be disposed of without danger of contaminating the soil by matter in suspension, or the air by gases and odors.

The question of the meaning of the invention depends upon the meaning of the word "dispose." Glover was not to dispose of the sewage; but he invented "an apparatus for the disposal of sewage;" Glover could dispose of his money, so the apparatus was to dispose of the sewage in the only way that an apparatus could dispose of it,— by getting rid of it.

Glover had disclosed to his countrymen by his first patent how an apparatus should be constructed and used to dispose of the sewage or sludge, or it is proper to presume that he thought he had disclosed the process because he said so in his patent, and the Glover Sanitary Sewerage Company claimed it as "our process" in the early part of 1895. Glover undoubtedly felt at liberty to incorporate a process that he claimed to have discovered in his later system of rapid filtration. Our right to the process dates back to Glover's right, or to 1882.

From the above-quoted evidence as to Glover's ideas and intentions at the time he disposed of his ideas to a corporation it is evident that he intended what he said he intended; or he was disposing of a "gold brick" to some of the most astute business men of New England. He intended intermittent filtration in the last two tanks of his series of five,— in the usual way if the beds were located outside the structure; aided by a heavy current of air in or through the filter bed if the filters were in the structure, the heavy current of air passing over the other beds of the series and carrying away the gases emanating from the matter in the other beds. One would not reasonably expect gases to arise from the tank charged with clear water, and very little gas from the anaerobic filter; consequently what gases were to arise would be expected to arise from the "sewerage" retained in the first tank, wherein the suspended matter of the sewage was to be disposed of, in part.

This direct, positive and documentary evidence as to Glover's ideas and intentions as to how his system of rapid filtration was to operate must have convinced the court that Glover intended his apparatus to operate in the manner he informed the public it was to operate, more especially, also, because it is the only way the apparatus can operate.

BOSTON "HERALD" ARTICLE OF OCT. 4, 1895.

SEWER FILTRATION SYSTEM.¹

The attitude of the State Board of Health toward the Glover filtration system of purifying sewage has reached an important and interesting stage. Some time next week it will announce whether or not it approves, for general adaptation to towns and cities, of this method. . . .

The interests of those who are concerned most closely with the system are being looked after by John N. McClintock, civil engineer, of this city. He has . . . studied the problem of sewage disposal extensively, both in this country and abroad. . . .

The experiment at Lawrence most nearly in line with the system proposed for Andover and Danvers was with a filter bed containing 60 inches in depth of sand. It received the supernatant liquid from sewage which had been allowed to settle four hours. . . .

The enclosed filter beds in the system recommended for Andover provide 1½ square yards of filtering surface for 1,000 gallons of sewage daily. The experiments at Lawrence do not cover this condition. . . .

Mr. McClintock said yesterday² to a Herald man:—

"The Glover system provides tanks for sedimentation, which may be used at any time for chemical precipitation, with provision for drawing off the clear water collected in the tanks upon a small filter bed, followed by the sludge, which, after drainage, can be composted with ashes, loam or sand, and removed. It provides a filter bed, through which the sewage, *deprived of much of its sludge*, is allowed to pass at the rate of 1,000 gallons per square yard per day *by intermittent filtration*. It provides for the working of this system throughout the year by covering the filter beds with a roof, and the ventilation of the sewage by a forced draught.

"The filter beds, being protected by a building, can be cared for and renewed at all seasons, and will not become a nuisance in any neighborhood.

"The partially purified and wholly clarified effluent from the covered filter beds is carried to an out-of-doors filter, where it is distributed by a series of overdrains, thoroughly ventilated, under a cover of loam. These out-of-door filter beds are thoroughly underdrained, and provide for the further purification of the sewage, allowing an acre for the purification of 100,000 gallons of sewage daily.

¹ Article condensed.

² Ten days after the second Glover patent was applied for.

"After the sewage has been clarified by sedimentation in the tanks, and purified by rapid, intermittent filtration through the first filter beds, so much of the impurities will be found to have been removed that an acre will probably purify from 300,000 to 500,000 gallons daily.

"What sewage passes through a 5-foot filter bed will not clog the over-drains. If it should clog the over-drains in the course of years, new over-drains could be laid at a trifling expense. If it was found that over-drains made of inverted troughs of hemlock boards lasted many years, the cost would be a mere trifle.

"If this system applies to the sewage disposal of a farmhouse, a village or a small town, it applies to a city of the size of New Orleans, Boston, Chicago or New York.

"Boston is now pumping the foul stuff, and pouring it out in front of her front door at the mouth of the harbor, or at Moon Island, making of the harbor a collecting tank. . . . In the course of the coming years, what is now a beautiful expanse of water will be a vast marsh, if the present system is maintained. . . .

"Sewage can be so treated that it becomes as pure as spring water. . . .

"The sewage [sludge] can be variously treated and disposed of."

COMMENTS.

Tanks which may be used for chemical precipitation hold four hours' flow of the sewage. The six tanks in the last Andover plan, referred to in "Herald" article, held twenty-four hours' flow.

The only improvement on the Glover apparatus for rapid filtration disclosed by the second Glover patent and described in the "Herald" article is the automatic action to control the flow of the effluent of the tanks to obtain intermittent filtration in the secondary beds; and we have secured patents for the only improvement.

At the time the above information as to the Glover system of rapid filtration was given to the "Herald" and to the public, Mr. McClintonck was the executive head and representative of the corporation controlling the Glover patents, and spoke officially, as he had the right to do.

The "Herald" article, Glover's circular, and the second Glover patent may have no special meaning to the barbarian; but to one skilled in the art of rapid filtration or any kind of filtration every word is weighty with meaning, definite and certain, and clearly disclosing the invention covered by the patent, as the law provides; and not to understand how the second Glover patent discloses rapid filtration ranks one as unskilled in the art.

PROPERTY INTERESTS.

The American Sewage Disposal Company of Boston, upon which has fallen the burden of establishing the validity and scope of the Glover patents, is a modest little corporation, as corporations go in these days of grand combinations of vested interests, but it is as much entitled to protection by the strong arm of the law as if it represented the investment of hundreds of millions of dollars.

The number of individuals forming the corporation is about 100, and the average investment is about \$1,000 each. This investment represents legally the heads of 20 families, and is entitled to the same protection as if the lives of 20 American citizens were involved.

We did not claim to be able to wring gold from the water of the ocean; but we did claim to be able to separate fresh water from organic matter which contaminated it; and to be able and willing to do the world good service, for a reasonable compensation in the form of a royalty.

We expended the money of the corporation wisely, under advice of learned counsel, and built up the edifice of our case stone by stone from a sure foundation, until it became a noble structure, proof against adverse winds.

We claim as our property the right to construct and use our apparatus to obtain rapid filtration, the exclusive right to so use it, and the monopoly of the right to construct and use it to obtain rapid filtration. We claim that the court, in construing our patent for a system of rapid filtration, confirm our rights to the property in the monopoly granted by the government as a reward to the discoverer and inventor.

This property of ours is the right to do good, like the degree of the doctor, the license of the druggist, the ordination of the minister, or the union card of the craftsman. As was feelingly said at a meeting of the American Society of Civil Engineers, by Glover's friend and pupil, it will prevent "the evil of allowing fake systems to demonstrate their inefficiency at public expense, in preference to taking sound professional advice." It gives us the right to prescribe our remedy where civic ailment is in the line of our specialty, and where broad irrigation or intermittent filtration is out of the question, and chemical precipitation is too burdensome, troublesome and offensive.

FINDING OF COURT.

As a matter of course we knew what Glover's apparatus was, how it was to be constructed, how it was to operate, and what it was to accomplish, but we did not know, until we were informed by the court, how the court would consider the invention as a whole, whether or not it was patentable under the patent law, or what part, if any, was protected by the patent.

We thought we knew that the primary filter beds in their functions had been disclosed by an earlier patent of Glover's, excepting the filtering material; we also had the opinion of eminent legal and scientific authority that the roof over the primary filter bed was not legally or scientifically essential; we knew that the value of our apparatus depended upon a tank charged with polluted water, constructed to accomplish certain results, permitting the effluent to escape clarified and partially purified to receive subsequent rapid purification upon outside filter beds; and we do not claim that the discovery and invention disclosed by the Glover second patent is a process that Glover had recognized and utilized many years before, and that he thought he had disclosed to the public in his first patent. We are satisfied that the court, in construing our patent for a system of rapid filtration, construe it in the very broadest way possible to cover a really great and important invention.

In view of the evidence submitted to the court, chiefly documentary and incontrovertible, as to Glover's struggles with his great idea, from its inception in 1875 until its perfection in his grand system of rapid filtration in 1895, it is impossible to understand how the court could have done otherwise than they did in finding that the patent discloses the invention.

PATENT LAW.

When the law of Congress is to the effect that to receive a patent the inventor must disclose his invention to those skilled in the art, and the court construe a patent, it is obvious that the patent law is based upon the old common law, founded on justice, equity, common sense and precedents, where the highest authority is vested in the court.

By the common law of England the highest authority was vested in the king; and the king could do no wrong.

As the highest authority in patent causes is vested in the court,

and as by common law the court can do no wrong, and as the court have found that our second Glover patent is for a system of rapid filtration, comprising two series of filter beds, one in a ventilated structure and the other outside, and as the law of nature enacted in the beginning is well established that rapid filtration is caused only by Glover's apparatus used in the way specified by Glover's second patent, the court must have intended to have found that the rapid filtration disclosed by the second Glover patent is due to the continuous flow or rot in Glover's primary filter bed.

If the court would inform us how we are to get rapid filtration by the Glover apparatus except by continuous flow, or septic action, or rot, in the primary filter bed, or if there is any man living in this wide world of ours of such deep learning and scientific attainment as to be able to inform us, the information would be of great value to us; but until we are so informed we are bound to believe that the court in awarding to us a system of rapid filtration, as disclosed by our patent, do so with a full knowledge of the fact that rapid filtration, the effect, is due to the anaerobic action or rot in our primary filter bed, which is the cause.

LAWS OF NATURE.

A most careful study of the evidence and exhibits in the case shows no misrepresentation to the court as to the natural laws involved in the case, and nothing as to Glover's intentions at any time that is material in the suit and that would adversely affect our case; therefore it is a logical deduction that the court understood the natural laws involved in the operation of Glover's apparatus when they found that the second patent is for a system of rapid filtration.

It is a difficult matter to explain why Glover's apparatus may operate sixteen hundred times more rapidly than an oxidizing filter of the same size, and sixteen thousand times more rapidly as an anaerobic filter than as an aerobic filter (because as the latter it can dispose of only what sewage would evaporate), for the reason that the action that makes the rapid filtration possible is life action, and as hard to explain as the life action in the human hand or eye; with life it is a very efficient organism; without life (and the proper kind of life, and the only life it will sustain, and the life that comes naturally to it in the sewage which it is to purify) it is like a dead hand or a dead eye.

It is also a difficult matter to explain why the secondary beds will purify the effluent of the primary bed ten times more rapidly than Glover suggested as possible in 1895, and a hundred times more rapidly than the Massachusetts State Board of Health thought possible in 1895; this is also due to the life action in the primary bed.

CLEARNESS OF PATENT.

There is not one word of the second Glover patent that has not a definite meaning applying to his system of rapid filtration and applying to no other possible construction.

It is well to bear in mind that a patent, while disclosing a new art or science, like that of rapid filtration for example, is not a treatise on the new art or science; its intent is to disclose to those having need of the new art or science the way to construct and use the apparatus specified in the patent to avail of the new invention. In the case of rapid filtration the public at large are deeply interested in the new science, for the reason that it applies not only to the sanitation of the largest city, but of the isolated house on the prairie or the hillside.

It is seen at a glance that our system of rapid filtration applies not only to the purification of the water carrying off the organic waste matter of the household, but also to the rapid purification of the water intended for domestic use by the family.

It is a very simple apparatus to construct; any man or boy of good common sense can build one from the specification of the patent; and it is operative within a very wide range of capacity, and wonderfully effective on almost any scale; yet why Glover's apparatus will do what Glover officially said it would do is as much a mystery to the most learned scientist as it is to the most ignorant savage.

Glover's ideas as to oxidizing bacterial action in the open-air sewage sand filters is clearly expressed in his circular, and as a matter of fact had been of common knowledge for many years in all parts of the world; and to apply Glover's ideas on the subject, which were of common knowledge, to the rapid filtration of the partially purified effluent of his cesspool converted into a primary filter bed, it only becomes necessary to underdrain and ventilate a small amount of filtering material to receive the effluent. If the air is drawn in and through this filtering material of the secondary bed and passes over the primary filter bed to the vent or chimney suggested by Glover in his circular and in his patent, the capacity

of the filtering material for the purification of the effluent of the primary bed would be increased in ratio to the force of the draught.

We do not claim that the second Glover patent discloses how the secondary beds for oxidizing bacterial action are constructed, and the court found that that was not essential; but we do claim, and the court have sustained our claim, that the patent discloses the system of rapid filtration so fully and clearly that one need not be skilled in the art to avail of the invention.

The inventor was not bound to convince the man or boy that his apparatus would operate. It is in evidence that the Glover system was adjudged "thoroughly impracticable" on several occasions, without even an investigation, so contrary did it appear to common sense. Glover could only point out the way to rapidly purify water; but he could not force the authorities to adopt his way, or even to permit him to put his system in operation in his native State.

In discovering and inventing a system of rapid filtration Glover placed himself in the front rank of those discoverers who have aided humanity in the onward progress from barbarism to civilization, and opened up a new art or science of inestimable value and benefit to his fellow man of all races and of all lands,—an invention that is bound to revolutionize sanitary conditions of the whole world for all time.

THE AMERICAN SEWAGE DISPOSAL COMPANY OF BOSTON,
By JOHN N. MCCLINTOCK, President and General Manager.

JOHN N. MCCLINTOCK.

STATE OF MASSACHUSETTS, COUNTY OF SUFFOLK, ss.

On this twenty-fourth day of December, 1906, personally appeared before me, a notary public, John N. McClintock, who, being duly sworn according to law, deposes and says that the statements set forth as above are true.

[SEAL]

ARTHUR THAD SMITH.

ADVERTISEMENT.

The American Sewage Disposal Company of Boston will undertake to construct for individuals, corporations or municipalities works embodying its system of rapid filtration in any part of the world.

Office, 643 Old South Building, Boston, Mass., U. S. A.

PERSONAL PRIVILEGE.

A copyright is granted to the author of a book with the consent and approval of all men. There is no prejudice against the copyright.

The same authority that grants the copyright grants the patent; but, although the principle is the same, there is a prejudice against the patent and the inventor. The copyright is safeguarded by the law as an almost sacred property right; whereas the patent and the patentee are differently treated.

Amasa S. Glover made a great and important discovery about 1880, and received a patent for his invention; he perfected his invention in 1895, and received a new patent; and directly and indirectly it has cost about \$100,000 to perfect his title to the invention which the court find his second patent discloses.

The court state: "The issue is narrowed down to the proposition: Are what are termed 'primary filter beds' in the patent in fact septic tanks?"

With the understanding that the term "septic tank" means the proper conditions for the development of septic action, the answer is plain: if the Glover apparatus is for rapid filtration, the primary filter beds are septic tanks, as the term is commonly understood. The Glover primary filter beds cannot possibly be used for anything save putrefactive action.

The only evidence in the case that the primary filter beds of the patent were not designed for putrefactive action was given by Frank Herbert Snow, an alleged civil engineer. Mr. Snow read into the patent the optional settling tank; ignored the form of beds with porous pipes disposed upon water-tight concrete bottoms; read out of the patent the submerged outlet pipes and the essential feature of the apparatus specified by the patent,—that the primary filter beds were to be charged with sewage; and testified, not that the primary beds could be used for the oxidizing

process, which is an impossibility, but that the inventor intended to so use them.

Both of us knew Glover intimately,—knew all about his invention and discovery, and what his patents disclose to experts; and both aided him in preparing plans.

Snow knew perfectly what Glover's ideas were, and bore witness to the same, as shown by the quotation from an address made by Snow, printed on page 38, *ante*.

If Glover intended to use the primary beds of the patent for oxidation, he had no knowledge of the art of filtration, no skill in the art, no common sense, and was not of sound mind.

New England history, which I have done my part to preserve, shows that my ancestors were honorable men and women, including ministers and magistrates of early colonial days, who would have scorned a lie and a liar. I certainly did not inherit a tendency to be untruthful.

I was brought up from childhood to believe that it was not only mean to lie, but that it was dishonorable. I did not learn to lie at home.

I did not learn to lie at Bowdoin College, under the instruction of Leonard Wood, Samuel Harris, professors Upham, Smythe, Packard, Young, Sewall or Chamberlain, as a student; or as instructor.

I did not learn to lie during my eight years' service in the Coast Survey, under Pierce, Whiting, Mitchell, Boutelle, Hosmer, Perkins or Anderson, or when I was in charge of my own party. In that corps it was considered dishonorable for an officer to lie.

During the next twenty years, or until I met Glover, in the practice of my profession I was employed by State, county and municipal authorities, corporations and individuals, in a great variety of engineering enterprises, where my judgment and integrity were relied upon by those employing me, and depended upon in court cases usually by counsel of opposing party.

During the most of these twenty years I lived in New Hampshire, and I counted as my personal friends most of the leading men of that State for a generation, including the chief justice, many of the governors, United States senators, judges, congressmen, bibliophiles, and men eminent in every walk of life; and I believe that my friends, living or dead, would rely upon my word. I certainly did not learn to lie from my intercourse with such men.

I not only found honesty the best policy, but the only policy for a civil engineer; for it is just as impolitic for a civil engineer to lie as it is for an accountant to add up a column of figures and give a false result,—he is morally sure to be found out.

I was introduced to Mr. Glover in the early summer of 1895.

I had commenced to study the effect of sewage upon rivers and harbors with Assistant Henry Mitchell of the United States Coast Survey in 1867; and I was prepared by study and observation to appreciate the importance and magnitude of Glover's discovery and invention, when it was disclosed to me by the inventor.

Glover explained to me, the first time I met him, his system of rapid filtration, and I understood it perfectly,—just as well as I do to-day,—and how it operates. He told me how to build and use his apparatus in order to obtain rapid filtration; and I am sure he understood what he was talking about.

Snow and I differed in our testimony as to how Glover intended his apparatus to operate to obtain rapid filtration. My evidence was corroborated by that of over a score of disinterested witnesses, including judges, civil engineers, city engineers, mayors of cities, bank presidents and treasurers and reputable citizens, who in some cases recalled years after the exact words by which Glover had explained to them his discovery and invention. Every word of my evidence was also sustained by documentary evidence, public records, newspaper clippings, maps and plans.

Snow testified in effect that Glover made the discovery and invention, but that in applying for his second patent Glover abandoned his great invention, and attempted to secure a patent for an absurdity; and Snow's evidence stands unsupported, unless the honorable counsel who obtained for Glover both of his patents intended to betray the interests of their client. Their letter to the patent office quoted my remarks to the "Boston Herald" reporter as to Glover's intentions, and gave me and the article as their authority for their statements; and their meaning cannot be perverted or misconstrued by an expert, save maliciously and without due regard to the value of sworn testimony.

I will quote some of Snow's testimony, sworn to and laid before the honorable court to aid them to do justice in the case:—

(R. 339.) I remember distinctly that Mr. Glover often questioned me about the use of the Brockton sludge beds, which was some time in

1895, and about how long the sludge took to dry out on any particular sludge bed to an extent sufficient to permit the next dose of sewage being applied to the same filter. This time was a week, and from this fact Mr. Glover obtained the idea of having seven primary filter beds, one for each day in the week. I know this to be so because of the conversation Mr. Glover had with me, and the fact that he told me it was his idea to have a sludge filter for every day in the week.

(R. 344.) I do not wish to be understood as meaning that the action in the primary filter bed is limited to straining only; but I do mean that the action on the liquid was intentionally limited to only such bacterial action as would occur in the rapid passage of sewage through a strainer, that is, largely aërobic action; and that the action on the sludge or intercepted solids was intentionally limited to such bacterial action as occurs in the sludge strained on the Brockton sludge filters, namely, largely the oxidizing or aërobic bacteria.

(R. 335.) I first met Mr. Glover in the spring of 1882, in an engineer's office at the City Hall, Brockton, Mass., where I was employed. Mr. Glover made that office a kind of headquarters. He experimented that summer at the poor farm, and I made various sketches for him and became familiar with his ideas. In 1890 I became city engineer, and from that time on he was a frequent caller at my home evenings and at my office daytimes. The conversation always related to sewage disposal. Mr. Glover made a confidant of me in many matters relating to his ambitions to make a business success of his invention, and I knew of his frequent disappointments.

(R. 394.) As near as I can recollect, certain beds were first set apart to receive sludge and nothing but sludge in the fall of 1895, and before this time the sludge was either mixed with the entire volume of the sewage in the reservoir, or it was delivered as sludge or as concentrated sewage upon beds upon which crops were being grown.

(R. 308.) On page 27 of my report for 1896 I said: "The 'agitator' has been operated as in the last two months of 1895, viz., for a few minutes at the end of each pump run, sending the sludge or heavier sewage to the beds at certain times."

(R. 400.) I do not deny that Mr. Glover contemplated the same sort of action in the settling tanks of the plan he offered to the city of Brockton, in 1887, as he claimed took place and destroyed the solids in his cesspools.

(R. 384.) I have been directly connected, either personally or through the firm of which I am the senior member, with the design and construction of ten plants comprising a combination of septic action with subsequent oxidation of the septic effluent, which plants have been completed and operated for some time; and, in addition to these, about

as many more for which plans have been made and either officially approved by the State in which the municipality is located, or the plans are about to be submitted for approval.

I can fancy the old soldier marching out to the Brockton muster field with Snow on a bleak November day to see Snow's seven acres of sludge filters, one for each day in the week, operated as strainers, and getting his ideas of his primary filters from Snow. But Glover's application for his second patent was on file in Washington Sept. 23, 1895.

Now, Snow was the only witness that defendant produced to construe for the court the meaning of the second Glover patent. Snow thus construed the patent:—

This outlet pipe ("which communicates with the filter bed, and receives the effluent therefrom and delivers it to the corresponding secondary bed") is shown in the drawing without any gate, and there is no mention in the description of the apparatus, anywhere, of the intended manner of use of this outlet pipe except the words I have just above quoted. It is therefore plainly evident that, in the absence of any gate or valve on the outlet pipe from the primary filter bed to its corresponding secondary filter bed, the retaining of the solids in the primary filter bed was to be accomplished by the filtering material, and that the liquid was to have free, unobstructed passage through the said outlet pipe at all times; or, in other words, there is no indication that there was any intention of holding the liquid in the primary filters, as is done in contact filters or settling tanks, or septic tanks where the liquid is purposely held back by gates.

This stuff might have been offered to the court by counsel whose business it is, or seems to be, to misrepresent the facts; but for an expert in the art of filtration it is another matter.

Snow was construing that form of the apparatus shown in Fig. 4 (page 12), where the primary filter bed is shown as charged with sewage. He not only does not find any gate or valve to the outlet pipe, but he does not find any inlet pipe, with gate controlling the flow, shown in Fig. 5, and might argue or testify that the tank was intended for a schoolhouse or a cold-air closet. The patent specifies "means for charging the same [primary filter beds] with sewage;" and Fig. 5, a cut reproduced from patent, shows the inlet pipe with gate, which is not otherwise specified, but which clearly indi-

cates that the flow of sewage is under control in the Glover apparatus. The fact that there is no gate shown to outlet pipe of tank depicted in Fig. 4 (p. 12) indicates that the apparatus was not designed for a settling tank, but for a continuous flow through a water-tight tank, and for putrefactive action, or rapid filtration.

In a formal address to the American Society of Civil Engineers, Sept. 25, 1901, when the Glover patents were under discussion by the society, Snow said: "No man has ever been able to tell just what Mr. Amasa Glover of Brockton, Mass., did invent or discover, and patent." Yet three years afterwards Snow was not only able to inform the court just what Glover "did invent or discover, and patent," but the very workings of Glover's mind.

The plans and specifications for a ship may convey no meaning to a farmer, but they are understood by the ship builder; the plans and specifications for a locomotive in like manner are understood by the master mechanic; the plans and specifications for a dwelling-house are intelligible reading to the builder.

The plans and specification of Patent No. 559,522, the Glover second patent, were presented to Prof. A. Prescott Folwell; and he explained to the court how the Glover apparatus, specified by the patent, would operate. His opinion was sustained by Messrs. Rudolph Hering, William E. McClintock, J. Y. McClintock, LeGrand Brown and Prof. Charles McMillan, all of whom are men eminent in the engineering profession, and skilled in the art to which the patent appertains.

To offset the opinion of these gentlemen as to what the patent discloses, the defendant depended upon the evidence of one very unreliable witness, a sample of whose evidence has been quoted.

The defendant had three other witnesses, City Engineer George A. Carpenter, Mr. Leonard Metcalf and Prof. Leonard P. Kinnicutt; but none of them were allowed to testify as to what the patent discloses to those skilled in the art of filtration.

The question arises, What do the court mean by rapid filtration? The construction of the primary filter-beds specified by the patent, with their trapped outlets, prevents any kind of oxidation.

In finding that the second Glover patent is for rapid filtration, the court agree with our experts.

There is more involved in this case than the fact that rapid filtration can be brought about by the Glover apparatus; it is a question that four great nations are interested in, — Germany, France, Great

Britain and the United States; for claimants for the honor of making the discovery of the value of putrefactive action in purification come from each of these countries,—Dr. Alexander Mueller of Germany, M. Louis Mouras of France, Amasa S. Glover of the United States, and Donald Cameron, C. E., of Great Britain.

The deeper I have gone into the matter the more convinced I am of the justice of the claims made for Glover as being the original discoverer and inventor of the process of utilizing putrefactive action, not only in rapid filtration, but also in any kind of filtration. The evidence and exhibits in our case all point that way. As the case developed, it appeared that we had the most to fear from anticipation from Dr. Mueller of Berlin; but a careful translation of the Mueller patent and Mueller's own statement in regard to his discovery showed that he did not anticipate Glover.

If the court construe the patent in accord with the law of Congress, which granted the patent and gave the right to the court to construe the patent, as understood by persons skilled in the art to which the patent appertains,—the court, in giving to us a system of rapid filtration, give to us the combination of septic action and oxidation.

If the court intended to find that the Glover patent is for a system of rapid filtration, comprising two series of oxidizing filter beds wherever situated, the court not only go outside of the patent, but ignore all the evidence in the case, and construe the patent for an absurdity, that the Patent Office, from a misunderstanding of the construction and use of the Glover apparatus, explicitly refused to patent.

The public and interested parties have no right to assume that the court are in error. The assumption is that the court are right in their finding, and that the court have not been misled.

If Snow's pretended stupidity in comprehending Glover's ideas as to rapid filtration gave him the possession of the system and the right to use it, it is an easy way to acquire property, it is so simple; but it is a bad precedent.

The court were informed by disinterested gentlemen and men of honor that the primary filter beds in the patent are for rapid filtration, and are in fact septic tanks, so called; Snow's evidence shows that, if the liquid is retained in tank, as shown in patent, it is a septic tank.

Science teaches that things equal to the same thing are equal to

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each other; and the law is established that the Glover apparatus is for rapid filtration. It is of common knowledge that the septic tank is for rapid filtration. While the law may not be a fixed science, it is not a lottery, a horse race or a game of chance; it purports to be somewhat scientific. The decision of the court as to a matter of fact whether the primary filter beds in the patent are septic tanks and for rapid filtration is based upon the evidence submitted to the court, and is in accord with the facts. Rapid filtration and septic action by the Glover apparatus are synonymous terms,—things equal to the same thing, things that are the same thing.

It appears that additional litigation becomes necessary to demonstrate the mathematical axiom:—

The Glover second patent is for rapid filtration (court).

The septic tank is for rapid filtration (common knowledge).

The second Glover patent is for the septic tank.

In the meanwhile, I am doing my best to impart to the whole world information in regard to Glover's discovery and invention of a system of rapid filtration, as I have been doing almost continuously since 1895. We desire the system to be used, in any event; we claim a reasonable royalty for the construction and use of our patented apparatus; we shall honestly endeavor to collect what is our due; and this document may be taken as a legal warning to infringers, and a summons or invitation to call at the office of the treasurer of the company and settle, and save costs.

Respectfully submitted to interested parties by



FEB. 18, 1907.

UNITED STATES PATENT OFFICE.

[Condensed Specification relating to Primary Filter Beds of Second Glover Patent No. 559,522, for Sewage Apparatus for Rapid Filtration.]

This invention has for its object to permit the *filtration* of sewage on a large scale without making the same offensive; and it consists in an apparatus comprising a series of primary filter beds and means for *charging* the same with sewage, a structure inclosing said primary beds and having provision for the removal of the gases emanating therefrom, the said primary beds being constructed to separate the solid from the liquid matter and to discharge the effluent wholly through filtering material, and a series of secondary filter beds located outside the said structure and arranged to receive said effluent by gravitation and adapted to complete the *purification* of the same, the effluent being clarified and sufficiently purified and deprived of offensive matter by the primary filter beds to permit its treatment by the secondary beds in the open air without offense . . . drawings [see page 12] forming a part of this specification. . . .

The sewage may be first deposited in a settling-tank . . . and after sedimentation of chemical precipitation in said tank the liquid and the sludge may be drawn off onto the primary filter beds . . . the settling-tank connected with pipe through which the sewage may be transferred to the primary filter-beds. . . .

The primary beds are constructed to arrest the solid matter and permit the escape of the liquid matter wholly through filtering material onto the secondary beds, so that the effluent will contain comparatively little offensive matter. The primary beds may be of any suitable construction to accomplish this end. For example, they may have water-tight bottoms of concrete

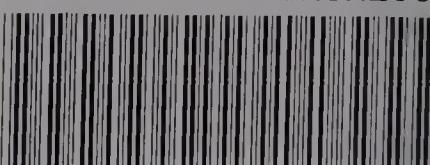
and a series of porous pipes, disposed upon the said bottoms and converging to an outlet pipe, the walls of said pipes constituting the filtering material. The pipes have no direct communication with the spaces inclosed by the walls of the primary beds and the effluent enters said pipes only through the porous wall of the pipes, which may be of unglazed earthenware.

I show primary filter beds composed of filtering material, such as sand and gravel or any of the materials used for such purposes, resting on a liquid-tight concrete bottom. An outlet pipe communicates with the filter bed and receives the effluent therefrom and delivers it to the corresponding secondary bed. . . .

It will be seen [upon trial] that the sewage matter is separated in the primary beds into two parts, the offensive matter being retained in the gas-removing structure, where it may be composted with ashes, loam, or sand and removed without offense, while the effluent is clarified and partially purified by being deprived of the greater part of the offensive matter, so that it may be rapidly disposed of in the open air by the secondary beds without being a source of offense. The secondary bed should be of much larger area than the primary beds.

I prefer to provide seven or more of the primary beds and an equal number of secondary beds, each primary bed and the accompanying secondary bed being of sufficient capacity to dispose of one day's sewage. The solid matter deposited in the primary beds may be removed from time to time in any suitable way. . . .

While the primary filtration takes place in a structure adapted to remove offensive



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gases, the secondary treatment, being in the open air, may extend for such length of time or over such an area of secondary beds as to completely dispose of the sewage.

Claim [of Glover Second Patent], —

A sewage apparatus comprising a series of stationary primary filter beds, a structure over said beds with provision for the removal of offensive gases therefrom, and a series of stationary secondary filter beds located outside the said structure and ar-

ranged to receive by gravitation the effluent from the primary filter beds, the said primary beds being constructed to discharge the effluent wholly through filtering material, whereby the offensive matter is retained in the structure and the effluent is clarified and partially purified, and whereby the said effluent may receive subsequent treatment in the open air by extensive secondary beds for any required length of time without offense.

NOTE.

Glover's first patent No. 258,744.

Opinion of the United States Circuit Court for the District of Rhode Island, August 25, 1904.

Opinion of the United States Circuit Court of Appeals for the First Circuit, June 13, 1905; August 15, 1906.